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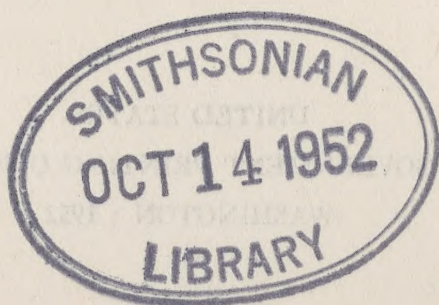
The *Proceedings*, begun in 1878, are intended primarily as a medium for the publication of original papers, based on the collections of the National Museum, that set forth newly acquired facts in biology, anthropology, and geology, with descriptions of new forms and revisions of limited groups. Copies of each paper, in pamphlet form, are distributed as published to libraries and scientific organizations and to specialists and others interested in the different subjects.

The dates at which these separate papers are published are recorded in the tables of contents of each of the volumes.

The present volume is the ninety-ninth of this series.

The *Bulletin*, the first of which was issued in 1875, consists of a series of separate publications comprising monographs of large zoological groups and other general systematic treatises (occasionally in several volumes), faunal works, reports of expeditions, catalogs of type specimens, special collections, and other material of similar nature. The majority of the volumes are octavo in size, but a quarto size has been adopted in a few instances in which large plates were regarded as indispensable. In the *Bulletin* series appear volumes under the heading *Contributions from the United States National Herbarium* in octavo form, published by the National Museum since 1902, which contain papers relating to the botanical collections of the Museum.

ALEXANDER WETMORE,
Secretary, Smithsonian Institution.



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A FURTHER CONTRIBUTION TO THE ICHTHYOLOGY OF VENEZUELA

By LEONARD P. SCHULTZ

THIS paper is the third report on the collections made by me in Venezuela during 1942 and those made by the U. S. S. *Niagara* in the Gulf of Venezuela during 1924 and 1925. Other miscellaneous small collections were included when they were found in the National Museum, as were others kindly lent for study and report. To the following I express my sincere gratitude for their kindness and cooperation: Dr. Reeve M. Bailey, Museum of Zoology, University of Michigan, lent some of the Bond Venezuelan collections made in 1938-40. Dr. Karl P. Schmidt and Marion Grey, Chicago Natural History Museum, lent the W. H. Osgood specimens taken in the Maracaibo Basin. Dr. William Beebe, New York Zoological Society, lent his collections from the vicinity of Caripito. Isaac Ginsburg, U. S. Fish and Wildlife Service, identified all the specimens of Gobiidae and Eleotridae in the above-mentioned collections. Dr. Samuel F. Hildebrand, of the same Service, while working up his collections of marine fishes from Panama, identified several species of Venezuelan marine fishes and aided in many other ways. Luis René Rivas very kindly checked the spelling of the Spanish names of fishes and of the localities.

My interest in Venezuelan ichthyology began in the winter of 1941-42 when, at the invitation of Dr. Guillermo Zuloaga, assistant chief of explorations, Creole Petroleum Corp., Caracas, I undertook to study

and make collections of fishes in the Maracaibo Basin of Venezuela. This work continued from February through May of 1942. I proceeded to Venezuela under the auspices of the Smithsonian Institution and of the United States Department of State and was a guest there of the then Standard Oil Co. of Venezuela, and of the Lago Petroleum Corp., Lago de Maracaibo. To the officials of these companies I again express my gratitude for their full cooperation.

My first report on these collections was entitled "The Catfishes of Venezuela, with Descriptions of Thirty-eight New Forms," published February 11, 1944, in the Proceedings of the United States National Museum, volume 94, pp. 173-338, 5 figs., 14 pls. In this report is given an itinerary of my travels in Venezuela along with a list of collecting stations. The second report, "The Fishes of the Family Characinidae from Venezuela, with Descriptions of Seventeen New Forms," was published September 6, 1944, in the same Proceedings, volume 95, pp. 235-367, 27 figs.

A summary of my Venezuelan collections during 1942 reveals that the largest number of species taken in one locality was 45 from the Río Negro. The next largest collection numbered 35 from the Río San Juan (Motatán system), 33 from the Río San Pedro, and 33 from the Río Socuy. In the stream systems where fairly representative collections were made the following number of species were preserved: Río Motatán, 54; Río Negro, 45; Río Palmar, 41; Río Socuy, 33; Río Apón, 31; Río Machango, 31; and Río Chama, 10. There were 56 species from Lago de Maracaibo and along the coast of Gulf of Venezuela to Caño de Sagua. Altogether my collections contained 140 species from the Maracaibo-Gulf of Venezuela Basins; 25 from Río Guárico and Río Torbes; 1 from Río Tuy system; and 3 species common to the first two basins, a total of 169 species and subspecies that I collected.

The present report is not intended to be comprehensive in scope, since there are not yet sufficient collections of fishes from Venezuela to justify the writing of a descriptive catalog. It is rather a report on several collections of Venezuelan fishes, with descriptions of new species, and represents only the beginning in the study of the fish fauna of Venezuela. It is highly desirable that much more extensive collections be made in all the stream systems and lake basins of the country.

Unless otherwise indicated all collections were made in 1942 by L. P. Schultz in the Maracaibo Basin. Abbreviations used to indicate museum catalog numbers are as follows:

A. N. S. P.=Academy of Natural Sciences of Philadelphia.

C. N. H. M.=Chicago Natural History Museum.

U. M. M. Z.=University of Michigan Museum of Zoology.

U. S. N. M.=United States National Museum.

GEOGRAPHY AND CLIMATE OF THE MARACAIBO BASIN

Lago de Maracaibo has an average depth of about 100 feet (maximum 34 meters, or 111½ feet) and a soft muddy bottom. From its southern end to the beginning of the channel at Punta de Palmas, south of the city of Maracaibo, it is 154.5 kilometers, or 95.8 miles, long; the length of the channel from Punta de Palmas to Punta Vigía at entrance into El Tablazo is about 39½ kilometers, or 24.3 miles; and from Punta Vigía across El Tablazo to the entrance into the Gulf of Venezuela at Castillo de San Carlos is 20.75 kilometers, or about 12.9 miles, making a total length from the Gulf of Venezuela to the southern end of the lake of 214.9 kilometers, or about 133.25 miles. The greatest width of the lake is about 121 kilometers, or 75 miles. The long axis of the lake is almost directly north-south.

High mountain ranges enclose the Maracaibo Basin on all sides except the north. The Sierra de Perijá forms the western divide, whereas the Cordillera Oriental occurs at the southwestern side, and along the southern and southeastern side the lofty Cordillera de Los Andes, with Pico Bolívar reaching to a height of 5,005 meters. Another range of high hills and mountains forms the eastern rim of the basin. The northern end of the Maracaibo Basin is semidesert, contrasting sharply with the tropical jungle at the southwestern and southern ends, where the rainfall is very great along the eastern slopes of the Cordilleras de Perijá and Oriental even during the dry season.

During 1941 the Maracaibo Nautical School recorded the following monthly average temperatures and total monthly rainfall at Maracaibo, as published February 14, 1942, in the *Maracaibo Herald*: January, 81° F., 4 mm.; February, 83° F., 6 mm.; March, 82° F., no rainfall; April, 84° F., 16 mm.; May, 85° F., 144 mm.; June, 85° F., 11 mm.; July, 85° F., 9 mm.; August, 85° F., 3 mm.; September, 85° F., 38 mm.; October, 83° F., 26 mm.; November, 84° F., 68 mm.; December, 83° F., 5 mm. The rainfall thus totals 330 mm., or 13 inches.

The average monthly rainfall for the eastern shore at Lagunillas is given below for a period of 14 years (1928–1941), from information furnished by the Lago Petroleum Corp. These records are in inches, with minima and maxima in parentheses. January, 0.22 (0.00 to 1.33); February, 0.26 (0.00 to 1.08); March, 0.69 (0.00 to 2.09); April, 1.59 (0.11 to 5.41); May, 4.47 (1.49 to 9.21); June, 3.20 (1.07 to 7.72); July, 3.81 (0.87 to 11.71); August, 4.05 (0.76 to 8.91); September, 4.89 (0.94 to 11.90); October, 6.21 (2.62 to 11.53); November, 3.52 (0.45 to 8.78); December, 0.80 (0.00 to 1.78). Total average rainfall 33.98 inches, with a minimum of 18.40 in 1939 and a maximum of 51.01 in 1933. These data indicate the increase in amount of rainfall southward in the Maracaibo Basin. Undoubtedly the heaviest rainfall occurs at the southwestern corner of the Basin where the jungle is

heaviest and where the big rivers empty large quantities of muddy water into the lake.

During the dry season from December through March the trade winds are strongest, blowing from the north and northeast through the channel and lengthwise across the lake, becoming strongest in the afternoon, late evening, or early part of the night. The surface water of the lake apparently has a counterclockwise rotation in the southern two-thirds of the lake.

The specific gravity of the water was taken by means of a salinometer, and the following readings were recorded: Gulf of Venezuela, 1.021 at mouth of Caño de Sagua on incoming tide; El Tablazo and at Maracaibo Yacht Club, 1.006; Lago de Maracaibo, 2 km. off Lagunillas, 1.004; and at southwestern end of the lake 2 km. off Río Concha, 1.002. The turbidity of the water may increase its specific gravity a little at the southern end of the lake. Undoubtedly the deeper waters of this lake are salty.

FISHERIES OF THE GULF OF VENEZUELA-MARACAIBO BASIN

The fishes of the Gulf of Venezuela and Lago de Maracaibo are almost untouched commercially as compared with the great fisheries of the North Sea and those of the Atlantic and Pacific coasts of North America. I believe the fisheries of Venezuela cannot be greatly developed until more modern fishing equipment, including quick-freezing refrigeration and power fishing boats with refrigeration equipment, are used extensively. Such equipment would permit fishermen to go farther, stay out longer, and still be able to bring back desirable fishes to the market without deterioration and spoilage.

These bodies of water contain an abundance of anchovies, completely unexploited and almost unknown to the fishermen. Some are small, but others reach a length of nearly a foot, and all are delicacies. A special type of net would have to be developed for their capture. Other species, I found, such as mullets (*lisa*), various catfishes (*bagre*), bocachicas and pámpanos (*Characinidae*), robalos (*Centropomidae*), kingfishes and Spanish mackerel (*carite* or *carite sierra*), pámpanos (*jurel*), leatherjackets (*zapatero de mar* and *palometa de lago*), snappers (*pargos*), grunts (*roncos*), groupers (*meros*), sargos, croakers (*corvinas*), and mojarras de río, are common market fishes sold either fresh or salted. Further investigation over a period of a year would probably have revealed other fishes in the Maracaibo Market.

This much was obvious: That new fishing methods should be tried, such as the beam-trawl, otter-trawl, fish traps, purse seines, and other fishing gear, depending on the bottom and depth of water and kind of fish desired. Now that sharks are in demand, shark fishing should be attempted in these waters. With the great abundance of blue crabs in the lake a valuable fishery could be developed.

Considerable destruction of fish life is undoubtedly caused by oil wells in the lake near the eastern shore for a distance of about 80 km. Far out into the lake the surface is more or less covered with a film of oil. At times and in certain places the petroleum forms a thick scum on the surface, and as the volatile portions evaporate the tarry residue becomes thicker and thicker, finally settling into the water in tiny to large globules. These, while suspended in the water, drift with the wind across the lake and saturate the beaches, covering the aquatic plants and shore vegetation and the bottom with a layer of petroleum, making existence for fish life very hazardous. Unless this oil leakage can be stopped the northern end of Lago de Maracaibo, at least, may become rather barren, the sources of fish-food production exterminated, and the possibilities of extensive and valuable fisheries in the future greatly reduced.

These great shallow bodies of water with large rivers emptying into them should be considered one of Venezuela's great natural resources. Together with the Gulf of Paria and the Río Orinoco and its delta they are capable of producing many millions of tons of fishery products annually. If they were developed and properly controlled a maximum yield would result from a minimum of fishing effort. Such a balanced condition between fishing and natural reproduction of fishes can be obtained only through unbiased studies by adequately trained fishery biologists and ichthyologists, who would recommend the proper controls for the various fisheries.

DISTRIBUTION OF FRESH-WATER FISHES

In this report the fresh-water fish fauna of Venezuela is considered as including those families whose genera and species are predominantly permanent inhabitants of fresh waters and which, except for the Cyprinodontidae, enter brackish waters only more or less as stragglers. Such families are: Pimelodidae, Callophysidae, Auchenipteridae, Ageneiosidae, Bunocephalidae, Cetopsidae, Pygidiidae, Doradidae, Callichthyidae, Astroblepidae, and Loricariidae (all catfishes), and in addition the Characinidae, Sternarchidae, Gymnotidae, Electrophoridae, Cyprinodontidae, Poeciliidae, Synbranchidae, Polycentridae, and Cichlidae.

The relationships and derivation of the fresh-water fish faunas of the various stream systems of Venezuela cannot be worked out at this time with any degree of certainty because the various species of fishes occurring in many of the drainage systems are as yet little known or unknown.

A list of drainage basins or stream systems of northern Venezuela is presented below to aid in the interpretation of this report. Each indentation indicates that the body of water is tributary to the one under which it is indented.

Gulf of Venezuela

Río Cocuiza

Río Capatárida

El Tablazo

Río Limón

Río Socuy

Lago Tulé

Lago de Maracaibo ¹

Río Palmar

Quebrada la Gé

Río San Juan

Río San Ignacio

Río Apón

Río Cogollo

Río Santa Ana

Río Negro

Río Catatumbo

Río Zulia

Río Pamplonita

Río Táchira

Río Escalante

Río Chama

Río Motatán

Río San Pedro

Río San Juan

Río Misoa

Río Machango

Caribbean Sea (coastal streams) ²

Río Tocuyo (Estado de Falcón)

Río Yaracuy (Estado de Yaracuy)

Streams near Puerto Cabello (Estados de Carabobo and Aragua)

Streams near La Guira and Macuto (Distrito Federal)

Río Tuy (Estado de Miranda)

Río Guaire

Río Unare (Estado de Anzoategui)

Río Manzanares (Estado de Sucre)

Golfo de Paria

Río San Juan

Guanoco or Pitch Lake

Río Guanipa

Orinoco Delta

Caño Mánamo

Río Morichal Largo

Río Tigre

Río Uraoa

Río Orinoco

Río Coroni

Río Caura

Río Suata

¹ All rivers listed in a counterclockwise direction around this lake.

² Listed from west toward the east beginning on the eastern side of the Península de Paraguana, opposite Coro, and continuing to the Gulf of Paria. Lago de Valencia is an enclosed basin at present, but it is listed below under the Orinoco system.

Caribbean Sea (coastal streams)—Continued

Golfo de Paria—Continued

Orinoco Delta—Continued

Río Orinoco—Continued

Río Manapire

Río Apure

Río Guárico

Río Portuguesa

Río Guanare

Río Chirgua

Río Pao

Lago de Valencia ³

Río Cojedes

Río Uribante

Río Frío

Río Torbes

During the preparation of a working distributional chart or table of the form published by Eigenmann,⁴ I came to the conclusion, after several days of labor, that such a chart, instead of giving a clear picture of the actual distributional relationships of the fish fauna for the various basins, instead presents a picture of the amount of collecting that has been done in these various basins, and the care with which the material was studied or reported upon. For instance, Eigenmann's report on the fresh-water fishes of British Guiana has a large number of new species, many based on a single specimen. There is no comparable work on the fauna of the Orinoco system or even the Amazon. Thus in such charts the Guianas appear to have a fauna greatly in excess of that of the Orinoco, because the fishes of the latter great river system have never been thoroughly investigated. The Orinoco system, with its direct connection through the Rio Negro with the Amazon, should have a fauna more extensive than that of the Guianas. Therefore, I concluded to confine my remarks on distributional relationships between drainage basins to general statements, awaiting the time when these faunas are better known.

The fresh-water fish fauna of the Maracaibo Basin is distinctive as to its species, since nearly every one except those living in river mouths is a little different structurally from those in adjoining basins and may be subspecifically distinct. When taken as a whole it appears that this fauna is almost as closely related to that of the Orinoco as to that of the Magdalena, especially those species inhabiting the upper courses of the rivers. The lowland species of the Maracaibo Basin appear to be very similar to those of the Magdalena, and some are the same species. Undoubtedly during the mountain building around the

³ Lago de Valencia is said to have been much larger at one time and to have had an outlet to the Orinoco system through the Río Pao.

⁴ Indiana Univ. Studies, vol. 7, No. 45, 1920; *ibid.*, No. 47, 1920; Eigenmann and Allen, Fishes of western South America, pp. 53-61, 1942.

western, southern, and southeastern sides of the Maracaibo Basin, stream capture has played some part in causing crossover of species among the Orinoco, Magdalena, Catatumbo, Santa Ana, and Chama Rivers. Just how extensive this may be must await extensive collecting in the headwaters of those rivers. In general, the genera occurring in the headwaters have a much more extensive distribution than those in the lower courses and in the lowlands. All the following genera of the Maracaibo Basin occur in the lower courses of the rivers and are distinctive for that Basin and so far have not been found outside of it: *Sovichthys*, *Perrunichthys*, *Hoplomyzon*, *Tridensimilis*, *Doraops*, *Saccoderma*, *Crcagrutops*, and *Hubbsichthys*. In a recent letter Cecil Miles reports finding *Dupouichthys* in the Magdalena system.

In view of the fresh-water nature of the southern part of Lago de Maracaibo, the fauna of all the rivers tributary to this lake may be expected to have the same species, with some distinctive ones isolated or restricted to the rapid or torrential parts of the rivers. This appears to be true so far as my collections from this Basin are concerned, but as yet no good collections have come from the headwaters of the Catatumbo, Escalante, or Santa Ana Rivers, among others. Undoubtedly the number of species will be nearly doubled when the Basin including the lake itself, is thoroughly searched and studied.

The numerous coastal streams emptying into the Caribbean Sea along the north coast of Venezuela are almost unexplored ichthyologically. When studied they should present another interesting chapter in Venezuelan ichthyology. These streams should be rich in cyprinodonts and other genera and species of the lowlands.

The fish fauna of the Valencia Basin is strikingly like that of the Río Guárico, with which it was once connected, but as in most of the stream systems it contains distinctive species not yet reported from elsewhere.

DISTRIBUTION OF MARINE FISHES

The specimens of fishes forming the basis of this report indicate in general that the marine fishes of Venezuela form a part of that fauna which extends from the Gulf of Mexico, Caribbean Sea, and West Indies southward along the coast of Brazil to the mouth of the Río La Plata. Certain elements of that fauna, as far as is known at present, appear to be restricted to such bodies of water as the Caribbean Sea, Gulf of Venezuela-Lago de Maracaibo, and Gulf of Paria. Undoubtedly as further collecting is done the ranges of these and many other species will be greatly extended.

Lago de Maracaibo is a great body of water, brackish at its northern end, probably salty in its deeper parts, but at least the great southern end with its many caños is fresh at the surface. This condition has made possible the infiltration of marine fishes from the Gulf of

Venezuela and of fresh-water species of fishes in the southern portion where the great rivers enter. Thus, Lago de Maracaibo contains an interesting mixture of marine, brackish, and fresh-water species. Although the fish fauna of the lake is not adequately known at present, enough knowledge has accumulated to indicate that the marine and fresh-water species have adapted themselves to live in this body of water, and in so doing some have changed a little structurally. These have evolved into more or less separate biological units, recognized in this report as either species or subspecies.

Those families of fishes that are usually considered marine by ichthyologists and that have representatives that have been found in Lago de Maracaibo and in the Río Orinoco are discussed below.

In Lago de Maracaibo, sharks, sawfishes, and large stingrays were reported, but I did not have an opportunity to fish for these. Sharks are caught by fishermen as far south as off the mouth of the Río Santa Ana. The occurrence of sharks in fresh-water lakes with access to the sea is not confined to Lago de Maracaibo. In Lake Nicaragua *Eulamia nicaraguensis* occurs in abundance and reaches a large size.

Among the elasmobranch fishes the stingrays of the family Dasyatidae have been most successful in evolving permanent species in South American fresh waters. The genus *Potamotrygon* has one species in the Río Orinoco and the Guianas, another in the Río Atrato, Río Magdalena, and Maracaibo Basins, and others farther south. These fresh-water stingrays occur far upstream, the females when caught often carrying young.

Several other marine families of fishes have representatives in fresh or brackish waters. The anchovies, or Engraulidae, have a few species occurring regularly in the fresh waters of the Río Orinoco and of the Lago de Maracaibo and its tributaries. These belong to the genera *Anchoa* and *Lycengraulis* in Venezuela.

The tarpon, *Tarpon atlanticus*, and the tenpounder, *Elops saurus*, are regular inhabitants of Lago de Maracaibo and in the lower courses of its large tributary rivers. The needlefishes, family Belonidae, were represented by *Strongylura timuacu*. The females, when taken at the southern end of Lago de Maracaibo, contained mature eggs that flowed from the vent with gentle pressure. This needlefish was taken far up the Orinoco system in the Río Apure. The Hemiramphidae, or halfbeaks, were represented by *Hyporhamphus roberti* in Lago de Maracaibo.

Two genera of pipefishes, or Syngnathidae, namely *Oostethus* and *Pseudophallus*, were found in the lower courses of rivers, probably in brackish water. Soles of the family Bothidae, genus *Citharichthys*, and tonguefishes, family Achiridae, of the genera *Hypoclinemus*, *Achirus*, and *Trinectes*, regularly occur in brackish water, a few venturing even into fresh waters.

I found the Atherinidae, or silversides, represented by a fresh-water species in Lago de Maracaibo, and another species in the northern end where the water is brackish. Lago de Valencia also has a species of silverside.

The mullets, or Mugilidae, are represented by *Agonostoma monticola* in Venezuelan fresh waters. *Mugil curema* and *M. brasiliensis* are found in brackish water in abundance, along with *M. trichodon*. I took *M. curema* at the southern end of Lago de Maracaibo in fresh water.

The robalos, family Centropomidae, are abundant in brackish, salt, and fresh waters, probably most abundant in brackish waters.

In the family Carangidae the leatherjacket, *Oligoplites palometa*, occurred in fresh, brackish, and salt waters. It is abundant in Lago de Maracaibo at the southern end in fresh water.

The mojarros, or carpetas, family Gerridae, represented by the genera *Eucinostomus* and *Diapterus*, were abundant in the brackish waters of Lago de Maracaibo and in coastal lagoons. Two species, *Eucinostomus argenteus* from the Río Apure and *Diapterus plumieri* from the Río Concha, were from fresh water.

The Ariidae are the only family of nematognaths, or catfishes, predominately living in salt and brackish waters. In my report on the catfishes of Venezuela I used the family name Bagreidae, which may be unfortunate since there is another family name spelled very similarly. I now use Ariidae in its place. Several genera and species of these marine catfishes occur regularly in both marine and brackish waters in abundance in Lago de Maracaibo and undoubtedly in the lower Río Orinoco.

In the croaker family, Sciaenidae, *Plagioscion* and *Pachyurus* may be considered fresh-water genera. They are found in the Río Orinoco but are not yet reported from the Maracaibo Basin. The corvina, *Cynoscion maracaibocensis*, is a brackish-water species probably confined to Lago de Maracaibo.

Several members of the Gobiidae and Eleotridae occur in brackish waters, such as the genera *Gobiomorus*, *Garmannia*, *Evorthodus*, *Bathygobius*, *Gobionellus*, and *Sicydium*, whereas the genera *Microphilypnus*, *Gobiomorus*, and *Sicydium* have been taken in fresh water.

Among the clingfishes, family Gobiesocidae, the only species occurring in fresh water is *Gobiesox cephalus*.

I found the puffer, *Sphoeroides testudineus*, family Tetraodontidae, very abundant in the brackish waters near Maracaibo, whereas *S. culepidotus* was very rare, but a single small specimen was collected in brackish water.

Gordon Gunter (Amer. Midl. Nat., vol. 28, No. 2, pp. 305-326, 1942) presents lists of fishes occurring in both fresh and salt waters of North and Middle America. No such list has been prepared for South America.

HISTORY OF ICHTHYOLOGY IN VENEZUELA

As far as I have been able to find the fresh-water stingray of the Río Meta in Venezuela, one of the most dreaded aquatic inhabitants, is the first fish of that country to be figured and described. It appeared in a paper by Roulin (1829), but it was not given a scientific name. The first scientific contribution appears to be that by two other Frenchmen, Cuvier and Valenciennes, who included in their famous work "*Histoire Naturelle des Poissons*" descriptions of new fishes, published from 1828 to 1849. M. Plée apparently sent specimens to the Paris Museum from the vicinity of Maracaibo and Lago de Maracaibo, Puerto Cabello, and La Guaira, as well as from other localities in the West Indies. The few species described by these French authors represented the known ichthyological fauna of the Maracaibo Basin for a period of 75 years, until after the turn of the century.

Although Boulenger in 1903 and Regan in 1903 and 1905 described a few new fishes from the Maracaibo Basin and from Venezuela, no extensive collecting of fresh-water fishes was done in the Maracaibo Basin until Dr. Franklin F. Bond took fair series during 1938 and 1939, and I made extensive collections during February through May of 1942.

Numerous authors have reported on small collections of Venezuelan fishes from outside the Maracaibo Basin, but the fish fauna of the Basin itself has remained an ichthyological incognito until the present. Even now it cannot be said that the fish fauna of Venezuela is well known; perhaps it is only half known, for there are no extensive collections from any of the major tributaries of the Orinoco system. The coastal rivers from the Gulf of Paria to the Maracaibo Basin are practically unknown ichthyologically. New and unusual forms of fishes should turn up as experienced collectors begin to work in these and other rivers of Venezuela. Even with the collecting in the Maracaibo Basin the two major rivers, the Catatumbo and the Santa Ana of that Basin, as well as the lake itself, remain practically untouched. My work and that of others should be considered only preliminary, for years of collecting must be done before the fishes of Venezuela are well known.

The following minor contributions on Venezuelan fishes should be mentioned: Rudolph Kner in 1854 and 1859 and Wilhelm Peters in 1860, 1868, and 1877 reported on early studies. Peters's 1877 report was based on specimens collected by Dr. Carl Sachs in Venezuela on his trip from September 27, 1876, to June 28, 1877. Albert Günther, 1859-1866, recorded a few species of fishes from Venezuela, mostly from Puerto Cabello, La Guaira, and the vicinity of Caracas. Another early author, Adolfo Ernst (1877), published a book that devoted three pages to fishes. Two other early authors, Charles Lütken

(1874) and F. Mocquard (1886, 1889), have referred to or described a species or so of fishes from Venezuela.

The outstanding contributions by Franz Steindachner, from 1868 to 1917, were based largely on specimens from the Orinoco system. His most important work, as far as Venezuela is concerned, appeared in 1910 and 1917.

Jacques Pellegrin (1899) reported on a small collection of fishes from the Río Apure system and wrote other papers from 1903 to 1912 that included Venezuelan records.

During more recent years other authors have mentioned a few species of fishes. Most important among these is Jan Metzelaar's 1919 report on the marine fishes taken by Dr. Boeke largely from the Venezuelan localities of Puerto Cabello, La Guaira, and Guanta. Dr. Carl L. Hubbs in 1920 described a new goby from near Macuto. Francesca La Monte in 1929 named two fishes from Mount Duida. Ernst Ahl in 1928 and Enrico Tortonese in 1939 recorded a few fishes from Venezuela.

Although Dr. Carl H. Eigenmann and his coauthors published a large series of papers on South American fishes, these give only casual mention of Venezuelan localities except in a single paper (Eigenmann, 1920a). Dr. A. S. Pearse in 1919 and 1920 reported mostly on the ecology of this same collection from the Valencia and Río Tuy Basins.

Henry W. Fowler, although mentioning Venezuelan fishes in several of his numerous papers, made two reports (1911, 1931) on collections made in Venezuela. The specimens on which Fowler based these reports came from northeastern Venezuela from streams tributary to the Gulf of Paria and from the lower Orinoco system.

Dr. George S. Myers, who has written numerous short papers on South American fishes, has referred to Venezuelan localities in several published from 1924 to 1944. He devoted a major part of the following contributions to Venezuelan fishes: 1927, "Descriptions of New South American Fresh-water Fishes Collected by Dr. Carl Ternetz"; 1928, "New Fresh-water Fishes from Peru, Venezuela, and Brazil"; 1932, "A New Genus of Funduline Cyprinodont Fishes from the Orinoco Basin, Venezuela"; 1935, "Four New Fresh-water Fishes from Brazil, Venezuela and Paraguay." His latest and largest contribution on Venezuelan ichthyology appeared in 1942 under the title "Studies on South American Fresh-water Fishes, I," in which he described some new species of fishes from the Maracaibo Basin, the first since the time of Cuvier and Valenciennes. The collections of Venezuelan fishes on which this paper was based were made largely by Dr. F. F. Bond during 1938-1939, but the bulk of Bond's fresh-water fishes are still at Stanford University and as yet not reported upon.

Codazzi (1940) published a 3-volume work and mentioned common

names of fishes in volume 1, pp. 259-267. His descriptions under each name indicate unfamiliarity with practically all the fishes discussed.

The book by Eduardo Röhl (1942) devotes pages 353 to 413, figures 172 to 230, to fishes. Although it is intended for popular use, the author used a most antiquated scientific terminology, based in large part on papers written over half a century ago. However, Röhl's book has been a valuable source of common names of Venezuelan fishes in spite of its other shortcomings from an ichthyological standpoint. It contains numerous records of marine fishes for Venezuelan waters found nowhere else.

My own contributions on Venezuelan fishes began in 1943, based on my collections made in 1942. In addition to these I have had at my disposal other collections that have been included in this and in previous reports. The first were a few specimens collected by Lyon and Robinson at Macuto, Venezuela, August 1 and 2, 1900, and given by them to the United States National Museum. Next, the Chicago Natural History Museum kindly lent for report and study a small collection made by Dr. W. H. Osgood in 1911 at Encontrados and other localities in the Maracaibo Basin, along with specimens collected in 1920 by Osgood and Conover. I also found in the national collections a few specimens collected by Dr. Henri Pittier in 1923, and by Dr. Arnoldo Gobaldon in 1935, probably in connection with the work of the International Health Board. Other fresh-water fishes from the vicinity of Caripito, collected by Dr. William Beebe in 1942, were kindly lent for study and report. Dr. Beebe has published a few papers on his Caripito expedition in *Zoologica* beginning in 1942. Almost the only marine fishes from Venezuela that I have had for study were those collected by the U. S. S. *Niagara* in the Gulf of Venezuela during 1924-1925, through the efforts of Capt. P. P. Blackburn, who sent them to the former U. S. Bureau of Fisheries. Later they were transferred to the National Museum through the courtesy of Dr. S. F. Hildebrand, who had reported on the anchovies from this collection in 1943. In addition I was able to obtain a few marine fishes during my 1942 Venezuelan trip.

The history of Venezuelan ichthyology may best be gained by a glance at the section "Literature Containing References to Venezuelan Fishes" at the end of this paper.

GLOSSARY OF VENEZUELAN LOCALITIES MENTIONED IN THIS REPORT⁵

Altigracia: Town at mouth of Maracaibo Strait.

Amuay, Bahía de: Bay in Gulf of Venezuela.

Asfálto, Lago (or Pitch Lake): Asphalt lake near Guenoco, east of Caripito.

Barcelona: Town in northeastern corner of Estado de Anzoátegui.

⁵ A map of the Maracaibo Basin was included in each of my previous reports on Venezuelan fishes (Schultz, 1944a, p. 175; 1944f, p. 367).

- Barquisimeto: Town on upper Río Cojedes, Estado de Lara (Orinoco system).
Bifurcation of Río Orinoco: Probably below Barrancas.
Burro, Isla del: Island in Lago de Valencia.
Caicara: Town on Río Orinoco below mouth of Río Apure.
Calabozo: Town on Río Guárico, Estado de Guárico.
Caños. (See under Ríos.)
Capatárida: Town near coast of Golfo de Venezuela, in Estado de Falcón.
Caracas: Capital of Venezuela, in Distrito Federal.
Cariaco, Golfo de: Gulf on coast of Venezuela, Estado de Sucre.
Caripito: Town on northern edge of Estado de Monagas.
Carúpano: Town in Estado de Sucre.
Ciénaga del Guanavara: Swamp about 10 km. north of Sinamaica.
Ciudad Bolívar: City on lower course of Río Orinoco.
Cumaná: Coastal city at mouth of Golfo de Cariaco, in Estado de Sucre.
Cumanacoa: Town in Estado de Sucre.
Duida, Mount: Mountain on the upper Río Orinoco in southern Venezuela.
Egido: Town 14 km. below Mérida, Estado de Mérida.
El Cable: Submarine cable at Carúpano, Estado de Sucre.
El Callao: Town on Río Yurupuri, south of Guacipatí.
El Mene: Town 56 km. east of Altagracia.
El Sombrero: Town on Río Guarico in Estado de Guárico near southern border of Estado de Aragua.
El Tablazo: Bay between Gulf of Venezuela and Lago de Maracaibo.
El Valle: Suburb south of Caracas.
El Valle: Settlement at Porlamar, Isla de Margarita.
Encontrados: Town on lower Río Catatumbo.
Estanques: Town on Río Chama, Estado de Mérida.
Estanques, Bahía de: Bay in Gulf of Venezuela.
Guacipatí: Town southeast of Ciudad Bolívar.
Guanta: Coastal town 13 km. northeast of Barcelona, Estado de Anzoátegui.
Guasdalito: Town in Estado de Apure.
Guenoco. (See under Lago de Asfalto.)
Higuerote: Seaport in Estado de Miranda.
Irapa: Town on shore of Golfo de Paria, Estado de Sucre.
Jacuque. (See under Punta.)
La Boca: Lago de Valencia.
La Florida: Town on eastern side of Caracas.
La González: Town in Estado de Mérida.
La Grita: Town in Estado de Táchira.
La Guaira: Town on coast of Distrito Federal.
La Pedrita: Near Uracoa, Estado de Monagas.
Laguna del Río Capatárida: Small lake at the mouth of the Río Capatárida.
Lagunillas: Town on east side of Lago de Maracaibo, Estado de Zulia.
Lagunillas: Town on Río Chama, Estado de Mérida.
Los Castillos: Town on Río Orinoco, below Ciudad Bolívar.
Los Monitos: Town near mouth of Río Limón, Estado de Zulia.
Macolla. (See under Punta.)
Macuto: Town on coast east of La Guaira, Distrito Federal.
Maracaibo: Large city at northern end of Lago de Maracaibo.
Maracaibo, Lago de: Largest lake of Venezuela, at northwestern end of country.
Maracay: City on shore of Lago de Valencia.
Margarita, Isla de: Island off northeast coast of Venezuela.
Maturín: Town in Estado de Monagas.

- Mene Grande: Town east-central side of Lago de Maracaibo, Estado de Zulia.
 Morón: Town 23 km. west of Puerto Cabello.
 Motatán: Town on eastern side of Lago de Maracaibo.
 Mucuchíes: Town on upper Río Chama, Estado de Mérida.
 Noguera: Town probably in Valencia Basin.
 Ocumare: Town on coast of Estado de Aragua.
 Palmarejo: Town across channel from Maracaibo.
 Pampán: Town 5 km. north of Trujillo, Estado de Trujillo.
 Paraguaná, Península de: Peninsula in Estado de Falcón.
 Pedernales: Town on Orinoco Delta at mouth of Caño Manamo.
 Perijá, Sierra de (Río Coguollo): Mountain range north of Maracaibo Basin.
 Petare: Town 13 km. east of Caracas.
 Piedras Bay: Bay in the Gulf of Venezuela.
 Pitch Lake. (See under Lago de Asfalto.)
 Porlamar: Town on Isla de Margarita.
 Pueblo Viejo: Town on east side of Lago de Maracaibo.
 Puerto Cabello: Coastal town, Estado de Carabobo.
 Punta Gorda: Point on east coast of Gulf of Venezuela.
 Punta Jacuque: Point in Gulf of Venezuela.
 Punta la Macolla: Point on Peninsula de Paraguaná.
 Punta Salinas: Point in Gulf of Venezuela.
 Punta Tigre: Point at mouth of Río San Juan, tributary of Golfo de Paria.
 Quebradas. (See under ríos.)

RÍOS, CAÑOS, and QUEBRADAS:

- Agua Caliente: Southwestern end of Lago de Maracaibo.
 Agua Caliente: 6 km. west of Puerto Cabello.
 Albireggas (probably same as Barregas): Above Mérida (Río Chama system).
 Alpargatón: 5 km. north of Morón, Estado de Yaracuy.
 Amana: Tributary of Río Guanipa, Estado de Monagas.
 Apón: About 35 km. south of Rosario, west side of Lago de Maracaibo.
 Apure: Large river, tributary of Río Orinoco, in central Venezuela.
 Atabapo: Tributary of Río Orinoco, near San Fernando de Atabapo, Colombian border.
 Barregas: Tributary of Río Chama, below Egido, Estado de Mérida, south end of Lago de Maracaibo.
 Borburata: Near Puerto Cabello.
 Bue: Tributary of Lago de Valencia.
 Cabriale (probably equals Cabrián): Valencia Basin, Estado de Carabobo.
 Cambur, Caño: Southeast of Valencia in Valencia Basin.
 Capatárida: Tributary of the Gulf of Venezuela, north coast, Estado de Falcón.
 Caripe: At Caripito.
 Caroní: Large tributary of Río Orinoco: its mouth is below Ciudad Bolívar.
 Cassiquiare: Large branch of upper Río Orinoco, connecting with Río Negro.
 Castaño: Valencia Basin.
 Catatumbo: Largest river at southwestern end of Lago de Maracaibo.
 Caura: Tributary of Río Orinoco.
 Cerro Grande: 10 km. east of Macuto.
 Chacaito, Quebrada: Eastern boundary of Distrito Federal.
 Chama: Southern end of Lago de Maracaibo.
 Chirgua: Tributary of Río Portuguesa.
 Cobre: Tributary of Río la Grita below La Grita, Estado de Táchira (Catatumba system).

- Cocuiza: Tributary of the Gulf of Venezuela, western boundary, Estado de Falcón.
- Cogollo: Tributary of Río Apón, west side of Lago de Maracaibo.
- Cojedes: Tributary of the Río Portuguesa.
- Concha: Southwestern end of Lago de Maracaibo.
- Coquenán. (See under Cuquenán.)
- Coroni: Tributary of Río Orinoco.
- Corozal: Small caño or stream between Uracoa and Río Tigre, Orinoco Delta.
- Cumboto: Near Ocumare, on the coast of Estado de Aragua.
- Cuquenán: Upper tributary of Río Caroni, with headwaters at Mt. Roraima.
- Curiepe: At Higuerote, Estado de Miranda.
- Cuyuni: Extreme eastern Venezuela, mouth at Georgetown, British Guiana.
- Escalante: Southern end of Lago de Maracaibo.
- Frío: Tributary of Río Uribante.
- Gé, Quebrada la: Tributary of Río Palmar near Rosario, west side of Lago de Maracaibo.
- González: Tributary of Río Chama at La González, Estado de Mérida.
- Guaiguaza: 3 km. west of Puerto Cabello.
- Guaire: At Caracas, Río Tuy system.
- Guanare: Tributary of Río Portuguesa.
- Guanipa: Empties into Golfo de Paria, west of Pedernales.
- Guanoco, Caño de: Near mouth of Río San Juan, tributary of Golfo de Paria.
- Guárico: Tributary of Río Apure, southeast of the Lago de Valencia Basin.
- Irapa: At Irapa, on Golfo de Paria, Estado de Sucre.
- Jimelles: Tributary of Río Motatán, east of Motatán, eastern side of Lago de Maracaibo.
- La Grita: Estado de Táchira (Catatumbo system).
- Limón: North of Maracaibo, tributary of El Tablazo.
- Macarupano: 5 km. southeast of Carúpano, Estado de Sucre.
- Machango: Small stream east side of Lago de Maracaibo, south of Lagunillas.
- Mamo: 15 km. west of La Guaira.
- Mánamo, Caño: Western channel of Orinoco Delta.
- Manapire: Tributary of Río Orinoco.
- Manzanares: Empties into Gulf of Cariaco, Estado de Sucre.
- Marguanta (probably equals Maruanta): Tributary of Río Orinoco east of Ciudad Bolívar.
- Meta: Large tributary of Río Orinoco running along south-central border of Venezuela.
- Misoa: 20 km. south of Lagunillas, east side of Lago de Maracaibo.
- Morichal Largo: Tributary of Caño Mánamo.
- Motatán: Southeastern end of Lago de Maracaibo.
- Negro: Tributary of Río Santa Ana, west side of Lago de Maracaibo.
- Noguera: At Noguera, probably Valencia Basin.
- Orinoco: Largest river of Venezuela, draining central and southern part of country.
- Paito: Valencia Basin, southwest and south of Valencia.
- Pájaros, de los: Southwestern end of Lago de Maracaibo.
- Palmar: Western side of Lago de Maracaibo.
- Pamplonita: Tributary of Río Zulia, Colombian and Venezuelan border, near Cúcuta, Colombia.
- Pao: Tributary of Río Chirgua.

- Paz: Valencia basin southwest of Valencia.
 Porlamar: Isla de Margarita.
 Portuguesa: Tributary of Río Apure.
 Quiribana, Caño de: Near Caicara, on Río Orinoco below mouth of Río Apure.
 Sagua, Caño de: About 25 km. north of Sinamaica, Estado de Zulia.
 San Esteban: Near Puerto Cabello.
 San Ignacio: 20 km. south of Rosario, western side of Lago de Maracaibo.
 San Juan: South of Rosario, western side of Lago de Maracaibo.
 San Juan: Tributary of Río Motatán, southeastern end of Lago de Maracaibo.
 San Juan: Tributary of Golfo de Paria.
 San Pablo: Caripito.
 San Pedrito: 55 km. east of Barcelona, Estado de Sucre.
 San Pedro: Tributary of Río Motatán, south of Mene Grande.
 Sanchón: 5 km. west of Tavorda or west of Puerto Cabello, Estado de Carabobo.
 Santa Ana: Large river western side of Lago de Maracaibo.
 Sargento, Quebrada: Tributary of Río Limón, north of Maracaibo.
 Socuy: Tributary of Río Limón, northwest of Maracaibo.
 Suata: Tributary of Río Orinoco.
 Tabor, Quebrada: Tributary of Río Motatán, 30 km. north of Trujillo.
 Táchira: Tributary of Río Pamplonita, west of San Antonio, Estado de Táchira (Catatumbo system).
 Tamanaco: At headwaters of Río Tinaco, Estado de Cojedes.
 Tapa Tapa: Tributary of Lago de Valencia.
 Tigre: Tributary of Río Morichal Largo.
 Tinaco: Estado de Cojedes.
 Tiquirito: Valencia Basin.
 Tocuyo: Estado de Falcón.
 Torbes: At Táriba, Estado de Táchira (Orinoco system).
 Turmero: Valencia basin.
 Tuy: Coastal river, Estado de Miranda.
 Unare: Estado de Anzoategui.
 Uracoa: Near Uracoa, west of Tucupita, Estado de Monagas.
 Urana: 40 km. west of Puerto Cabello.
 Uribante: Tributary of Río Apure, its mouth just northeast of Guasdalito.
 Valle: Tributary of Río Guaire, just southeast of Caracas.
 Yaracuy: 45 km. northwest of Puerto Cabello, in Estado de Yaracuy.
 Yarapa. (See under Irapa.)
 Yasa: Tributary of Río Negro, western side of Lago de Maracaibo (Santa Ana system).
 Yuruari: Extreme eastern Venezuela, tributary of Río Cuyuni, the mouth of which is at Georgetown, British Guiana.
 Zulia: Tributary of Río Catatumbo.
- Rosario: Town 95 km. southwest of Maracaibo.
 Salina Rica: Marsh 5 km. north of Maracaibo.
 Salinas, Bahía: Bay in Gulf of Venezuela.
 Salinas. (See also under Punta.)
 San Antonio: Town in Estado de Táchira.
 San Carlos: Town in Estado de Cojedes.
 San Casimiro: Town in Estado de Aragua.
 San Cristóbal: Town in Estado de Táchira.
 San Esteban: Town near Puerto Cabello.

San Felipe: Town in Estado de Yaracuy, on Río Yaracuy.

San Félix: Town on western boundary of Estado de Falcón, near mouth of Río Cocuiza.

San Fernando de Apure: City just below mouth of Río Portuguesa, tributary of Río Apure.

San Fernando de Atabapo: Town on Colombian border.

San Román, Cabo: Cape at outer tip of Península de Paraguaná.

San Sebastián: Town in Estado de Aragua.

Santa Bárbara: Río Orinoco, southern Venezuela.

Santa Bárbara: Town near upper Río Amaná, Estado de Monagas.

Santa Rosa, Salina: About 3 km. north of Maracaibo.

Sinamaica: Town near mouth of Río Limón, north of Maracaibo.

Soledad: Town across river from Ciudad Bolívar.

Tacarigua, Laguna de: Lake at coast, Estado de Miranda.

Táchira, Estación: Town 60 km. north of San Cristóbal, Estado de Táchira.

Táriba: Town in Estado de Táchira.

Tavorda: Town 6 km. west of Puerto Cabello.

Tigre. (See under Punta.)

Tinaquilla: Town in Río Portuguesa drainage, Estado de Cojedes.

Totuma: An oil field about 100 km. southwest of Maracaibo near Río Palmar.

Trujillo: Town in Estado de Trujillo.

Tucacas: City on east coast of Estado de Falcón, about 60 km. northwest of Puerto Cabello.

Tucupita: Town on Caño Mánamo, Orinoco Delta.

Tulé, Lago: Lake about 75 km. west of Maracaibo, tributary of Río Socuy system.

Upata: Town about 125 km. east of Ciudad Bolívar.

Uracoa: Town in Estado de Monagas, west of Tucupita.

Valencia, Lago de: Large lake southeast of Puerto Cabello.

Valera: Town in Estado de Trujillo.

TAXONOMIC SECTION

Class ELASMOBRANCHII

Subclass SELACHII

Superorder SELACHOIDEA: Sharks and Rays

The sharks and rays may be distinguished from the bony fishes by the differences in the number of external gill openings, in sharks 5 to 7 on each side, whereas in the bony fishes there is a single external gill opening. The gills of bony fishes are covered by the operculum. The upper lobe of the caudal fin is longest.

The sharks of Venezuelan waters are fully described and keyed out to species in "Fishes of the Western North Atlantic" by Dr. H. B. Bigelow and William C. Schroeder (Mem. Sears Foundation Mar. Res. No. 1, pp. 59-576, figs. 6-106, 1948). It is not considered necessary here to report upon them in detail, since all my Venezuelan specimens were studied by those authors.

Order LAMNOIDEA

Suborder GALEOIDEA

Family ORECTOLOBIDAE: Nurse Sharks

Genus NEBRIUS Rüppell

Nebrius RÜPPELL, Neue Wirbelthiere, Fische, p. 62, 1835. (Genotype, *Nebrius concolor* Rüppell.) (Ref. copied.)

According to Fowler, U. S. Nat. Mus. Bull. 100, vol. 13, p. 67, 1941, *Ginglymostoma* Müller and Henle, 1837, is a synonym.

NEBRIUS CIRRATUS (Gmelin)

GATA

Squalus cirratus GMELIN, Systema naturae, vol. 1, p. 1492, 1788 (American seas) (ref. copied).

Ginglymostoma cirratum RÖHL, Fauna descriptiva de Venezuela, p. 365, fig. 178, 1942 (coast of Venezuela).

Family ISURIDAE: Mackerel Sharks; Tiburones

Genus LAMNA Cuvier

Lamna CUVIER, Le règne animal, vol. 2, p. 126, 1817. (Genotype, *Lamna cornubica* Cuvier=*Squalus cornubicus* Gmelin.) (Ref. copied.)

LAMNA NASUS (Bonnaterre)

PORBEAGLE; TIBURÓN CARITE

Squalus nasus BONNATERRE, Tableau encyclopédique ichthyologie, p. 10, pl. 85, fig. 350, 1788 (no locality) (ref. copied).

Isurus nasus RÖHL, Fauna descriptiva de Venezuela, p. 366, 1942 (coast of Venezuela).

Suborder SCYLIORHINOIDEA

Family GALEORHINIDAE: Gray Sharks; Tiburones

Genus SCOLIODON Müller and Henle

Scoliodon MÜLLER AND HENLE, Sitzb. Akad. Wiss. Berlin, 1837, p. 114. (Genotype, *Carcharias* [*Scoliodon*] *laticaudus* Müller and Henle.) (Ref. copied.)

SCOLIODON TERRAE-NOVAE (Richardson)

SHARP-NOSED SHARK

Squalus (*Carcharias*) *terrae-novae* RICHARDSON, Fauna Boreali-Americana, vol. 3, p. 289, 1836.

Carcharias (*Scoliodon*) *terrae-novae* METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904–1905, p. 6, 1919 (Puerto Cabello, Venezuela).

U. S. N. M. No. 127098, 4 small specimens, Gulf of Venezuela, U. S. S. *Niagara*, December 1924.

U. S. N. M. No. 123221, a postembryo, 182 mm. in total length, Gulf of Venezuela, U. S. S. *Niagara*, 1925.

Genus GLYPHIS Agassiz

Glyphis AGASSIZ, Recherches sur les poissons fossiles, vol. 3, 243, 1843. (Genotype, *Glyphis hastalis* Agassiz.) (Ref. copied.)

GLYPHIS GLAUCUS (Linnaeus)**GREAT BLUE SHARK; TIBURÓN AZUL**

Squalus glaucus LINNAEUS, Systema naturae, ed. 10, vol. 1, p. 235, 1758 (Europe.)
Prionace glauca RÖHL, Fauna descriptiva de Venezuela, p. 364, fig. 176, 1942 (coast of Venezuela).

Genus GALEOCERDO Müller and Henle

Galeocerdo MÜLLER AND HENLE, Sitzb. Akad. Wiss. Berlin, 1837, p. 115. (Genotype, *Squalus arcticus* Faber, in Müller and Henle.) (Ref. copied.)

GALEOCERDO CUVIER (Lesueur)**TIGER SHARK; LEOPARD SHARK; TINTORERA**

Squalus cuvier (Peron and Lesueur) LESUEUR, Journ. Acad. Nat. Sci. Philadelphia, vol. 2, p. 351, 1822 (northwest coast of New Holland).
Galeocerdus maculatus RÖHL, Fauna descriptiva de Venezuela, p. 365, fig. 177, 1942 (coast of Venezuela).

This species is *Galeocerdo arcticus* of authors.

Genus MUSTELUS Link

Mustelus LINK, Mag. Phys. Naturg. Gotha, vol. 6, pt. 3, p. 31, 1790. (Genotype, *Squalus mustelus* Linnaeus.)

MUSTELUS CANIS (Mitchill)**DOG SHARK; CAZÓN**

Squalus canis MITCHILL, N. Y. Lit. Philos. Trans., vol. 1, p. 486, 1815 (New York).
Mustelus canis RÖHL, Fauna descriptiva de Venezuela, p. 364, 1942 (coast of Venezuela).

Family SPHYRNIDAE: Hammerhead Sharks**Genus SPHYRNA Rafinesque****HAMMERHEAD SHARKS; PEZ MARTILLO O CORNUDA**

Sphyrna RAFINESQUE, Indice d'ittologia siciliana, p. 60, 1810. (Genotype, *Squalus zygaena* Linnaeus.) (Ref. copied.)

SPHYRNA BIGELOWI Springer

Sphyrna bigelowi SPRINGER, Journ. Washington Acad. Sci., vol. 34, pp. 274-276, figs. 1A-1D, 1944 (Uruguay and Brazil).

U.S.N.M. No. 123217, head only, measuring 230 mm. across greatest width, Amuay Bay, U. S. S. Niagara, May 15, 1925.

SPHYRNA ZYGAENA (Linnaeus)

Squalus zygaena LINNAEUS, Systema naturae, ed. 10, vol. 1, p. 234, 1758 (Europe; America).
Sphyrna zygaena RÖHL, Fauna descriptiva de Venezuela, p. 366, fig. 179, 1942 (coast of Venezuela).

Superorder HYPOTREMATA

Order BATOIDEA: Rays and Skates

This order includes those elasmobranch fishes that have a greatly depressed head and body, with the pectoral fins greatly expanded and continuous with the head and body, forming more or less of a disk. The five gill openings occur on the ventral or under side of the head, in front of which is the mouth. The snout is depressed and forms part of the disk or projects forward.

Suborder RAJIFORMES

Family PRISTIDAE: Sawfishes

This family is characterized by the presence of a long bladelike snout, the sides of which have large projecting "teeth" or spines set in a socket. In Venezuelan waters these number from 14 to 30 or a few more.

Genus PRISTIS Link

SAWFISHES, PEZ SIERRA

Pristis LINK, Mag. Phys. Naturg. Gotha, vol. 6, pt. 3, p. 31, 1790. (Type, *Squalus pristis* Linnaeus.)

KEY TO THE SPECIES OF PRISTIS REPORTED FROM VENEZUELA

- 1a. Teeth on each side of "saw" number 15 to 22; lower caudal lobe present; origin of first dorsal in front of pelvic insertion.....*Pristis microdon* Latham
- 1b. Teeth on each side of "saw" number 24 to 32; lower caudal lobe absent; origin of first dorsal opposite pelvic insertion...*Pristis pectinatus* Latham

PRISTIS MICRODON Latham

Pristis microdon LATHAM, Trans. Linn. Soc. London, vol. 2, p. 280, pl. 26, fig. 4, 1794 (locality?).

Pristis perrotteti RÖHL, Fauna descriptiva de Venezuela, p. 366, fig. 180, 1942 (coast of Venezuela).

U. S. N. M. No. 27420, rostrum from Maracaibo.

PRISTIS PECTINATUS Latham

Pristis pectinatus LATHAM, Trans. Linn. Soc. London, vol. 2, p. 278, pl. 26, fig. 2, 1794 (in the ocean).

U. S. N. M. No. 121000, 1 specimen, Point Macolla, U. S. S. *Niagara*, April 19, 1925.

In addition, several saw blades of this species and of *Pristis microdon* were seen at the mouth of Caño de Sagua on the beach north of Sina-maica, where fishermen had left them.

The teeth on several blades of both species were counted, and it is interesting to note that frequently one or two more teeth occur on the

right side than on the left. I record my counts below, first for the left side then for the right, respectively:

For *microdon*, from the Río Tuyra, Panama: 20-21; 21-22; 19-19; 18-19; 21-23; 19-20; 20-20; 19-19; 17-18; 18-18; 19-20. Also from Lake Nicaragua: 18-18 and 15-15.

For *pectinatus*, from the Gulf of Venezuela: 28-29; from Lake Nicaragua 26-26; from Florida 25-25.

Family DASYATIDAE: Stingrays; Rayas

This family may be recognized by the presence of a "sting" or sharp serrated spine, sometimes two of them, on the dorsal surface of the tail. The pectoral fins are continuous with the snout in this family, the snout scarcely projecting or not projecting in front of the general outline of the disk-shaped body.

Many persons and some uninformed naturalists have the opinion that stingarees, as they are commonly called, do not have a poisonous sting. Those who have studied these fishes and have had personal experience with them are certain that the "sting" is highly venomous. Before I cite cases of persons who have been jabbed by the spine of a stingray, I shall acquaint the reader with these fishes and the nature of their sting or spines.

The stingaree is one of the rays, fishes related to the sharks and greatly resembling them in structure. In shape, however, they are flattened and disk-shaped and have a long tail. The rays, which bear a long sharp spine, usually in the middle upper part of the tail, are known as stingrays, a word corrupted to stingaree.

Several dozen species of stingrays are known to science. These creatures occur in all warm seas, as well as in many of the tropical rivers, some fresh-water stingrays in South America occurring even more than a thousand miles above the river mouth. Wherever stingrays occur—in the seas, bays, or in rivers—they are to be found hiding on the bottom in mud or sand. If disturbed, they swim with an undulating motion, usually close to the bottom, and stir up a cloud of mud, then come to rest on the bottom, the muddy cloud gradually settling around the ray. This "mud cloud" and the camouflaged coloration of the fish itself serve a definite purpose in concealing it. While thus partly buried in the sand or mud bottom the stingray is in perfect readiness to drive its sting into any unsuspecting victim that may step on it. The weight of a person stepping on the disk-shaped part of the body anchors the stingray, giving it the needed leverage to whip its tail upward with uncanny precision and drive the already erected spine or sting into its target. The sting on the powerful tail of even a small ray only a foot across in size can pass through a person's foot or into a leg bone.

During 1942 my assistant, Rafael Navarro, and I were collecting fishes in a swamp north of Sinamaica, Maracaibo Basin. We had walked nearly half a mile across this shallow muddy mire, pushing a small boat (cayuca) in front of us. Along the way we noticed many stingrays measuring up to a foot across their disks. The water was a few inches to a foot deep, and our feet sank as far into the soft muddy bottom. We made a fair collection of the various kinds of fishes present and started back. I urged Navarro not to pick up his feet in this mud but to push them forward at the surface to avoid stepping on a stingray.

Suddenly I heard him cry out in agony. A stingaree had driven its spine into his ankle, but fortunately the spine did not break off. When we reached shore I cleaned the wound, swabbed it out with iodine, and bandaged it. At camp that night I found the wound was deep, to the bone, but the flesh showed little swelling. I washed it and put on a larger bandage saturated with 1:1000 metaphen. After a week of this treatment the lesion was completely healed.

Since all stingarees hide, partly buried in the mud or sand of the bottom, they are always a potential danger to all who wade over such bottoms in tropical seas or in certain tropical rivers. Since the chief hazard is caused by stepping on one of these fishes it is almost completely eliminated by pushing one's feet along the bottom in the upper layer of mud or sand. Another method of avoiding the danger would be to carry a pole and probe the bottom as one walks forward. The moment something touches the ray it wiggles off.

KEY TO THE GENERA AND SPECIES OF DASYATIDAE REPORTED OR EXPECTED IN VENEZUELAN WATERS

- 1a. Outline of disk concave at each side of projecting snout, then rounded; greatest width of disk a little more than length of disk from tip of snout to its most posterior margin, not including pelvies; caudal fin moderately narrow, with its tip bluntly rounded; caudal fin with rays; eye and spiracle not quite equal to interorbital space; distance from front of oronasal groove to rear corner of nasal flap 2 in width of nasal flap; eye $2\frac{1}{2}$ in interorbital space and $4\frac{1}{4}$ in length of snout; an irregular series of small tubercles or spines along middle of back behind interorbital space and on tail; color plain light brownish gray in alcohol.... *Urotrygon venezuelae*, new species
- 1b. Outline of disk, at each side of snout rounded or nearly so, not concave; greatest width of disk less than length of disk from snout to its posterior margin, pelvies not included.
- 2a. Caudal fin broad, short, and bluntly rounded; greatest width of caudal fin nearly equal to width of nasal flap; caudal fin with rays; eye and spiracle much greater than interorbital space; distance from front of oronasal groove to outer rear corner of nasal flap about 2 times in width of nasal flap; eye large, equal to or greater than interorbital space and about 2 in the snout; no spines along middle of back and tail only small prickles; fourth gill slit a little closer to center of anus than to snout tip; color in

- alcohol brown with numerous small white spots everywhere on dorsal surface (fig. 1)-----*Urobatis sloani* (Blainville)¹
- 2b. Caudal fin narrow, long, and tapering to a point (end of tail usually missing in adults) and without rays; eye and spiracle about $1\frac{1}{2}$ in interorbital space; distance from front of oronasal groove to corner of upper lip contained about $1\frac{1}{2}$ in width of nasal flap; eye moderate about $2\frac{1}{2}$ in interorbital space and 4 in snout; a series of rather strong spines along mid-dorsal line of tail in front of sting; middle gill slit, about equidistant between tip of snout and center of anus; color in alcohol brownish or blackish dorsally, tail with bars or underside sometimes blotched; outer part of disk on ventral side grayish to brownish—fresh-water species. (*Potamotrygon*.)
- 3a. Coloration of ventral side of disk mottled with brownish; sides of tail in front of sting with regularly placed pale roundish to oblong spots and behind base of sting barred with pale spots (Amazon and Guianas)-----*Potamotrygon hystrix* (Müller and Henle)
- 3b. Coloration of ventral side of disk plain pale, the margins of disk plain darkish to pale grayish, not mottled.
- 4a. Sides of tail in front of sting mottled but not with regularly placed pale or whitish oval spots; tail behind base of sting nearly plain black without definite pale bars (Magdalena, Atrato, and Maracaibo Basins)-----*Potamotrygon magdalenae* (Duméril)
- 4b. Sides of tail in front of sting with regularly placed pale or whitish oval to roundish spots; tail behind base of sting with distinct pale bars (Orinoco Basin)-----*Potamotrygon humboldtii* (Duméril)

Genus UROTRYGON Gill

Urotrygon GILL, Proc. Acad. Nat. Sci. Philadelphia, 1863, p. 173. (Genotype, *Urotrygon mundus* Gill, U.S.N.M. No. 7297, west coast of Central America.)

UROTRYGON VENEZUELAE, new species

STINGRAY; RAYA DE AGUA SALADA

FIGURE 2

Holotype.—U.S.N.M. No. 121966, a female measuring 255 mm. from tip of snout to tip of tail, collected by the U. S. S. *Niagara* in the Gulf of Venezuela at Point Macolla, April 19, 1925.

Description (of only known specimen).—Width of disk a little greater than the length of disk from tip of snout to its posterior margin not including pelvic; snout a little produced so that at each side of snout the outline is a little concave, then convex; outline of pelvic fins rounded, completing the circular outline of the disk; center of anus to tip of tail equal to distance from tip of snout to rear margin of pelvics; length of snout 3.4 in snout to center of anus; least interorbital width $2\frac{1}{2}$ in snout; middle gill slit equidistant between tip of snout and center of anus; base of sting closer to tip of tail than to anus by twice diameter of eye; eye 2.4 in interorbital space, and about 5.7 in snout; caudal fin moderately narrow, the greatest height of caudal fin about equal to diameter of eye; interorbital space a little concave; back everywhere

¹ Not yet reported from Venezuelan waters.

covered with prickles; color in alcohol plain pale above and below, no spots anywhere, although specimen appears to be faded.

The following measurements, expressed in hundredths of the distance from tip of snout to tip of sting, 210 mm., were made: Width of disk 65.7; length of disk from snout tip to its rear edge not including pelvics 61.7; interorbital space 6.90; greatest interspiracular space 11.4

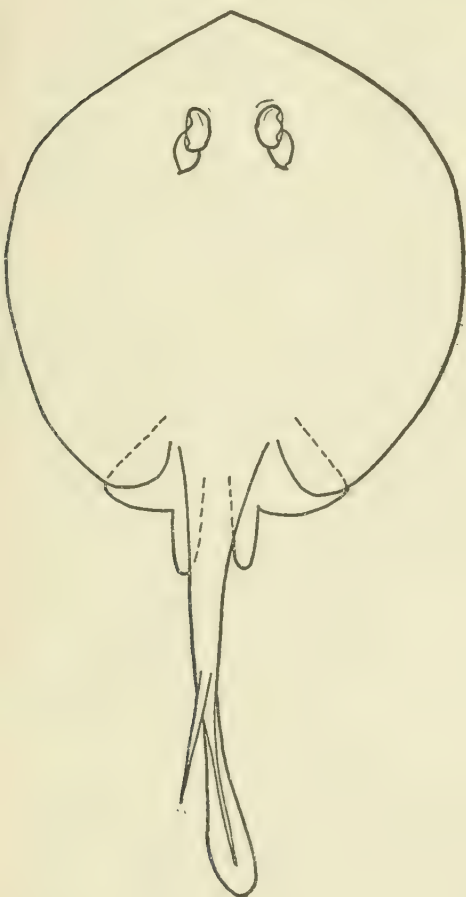


FIGURE 1.—*Urobatis sloani* (Blainville)
(U.S.N.M. No. 4656) from Cuba,
collected by Poey. Sketch by author.

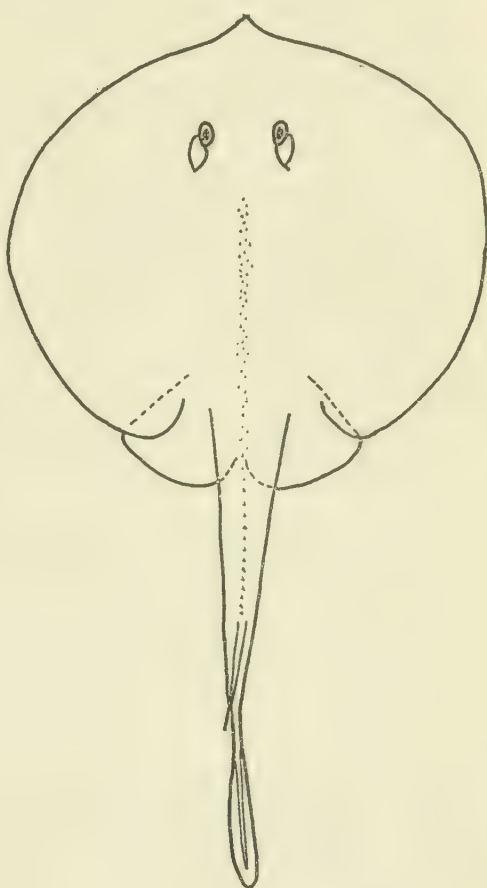


FIGURE 2.—*Urotrygon venezuelae*, new
species: Holotype (U.S.N.M. No.
121966), female, 255 mm. in total
length. Sketch by author.

and least interspiracular space 8.57; diameter of eye 2.86; length of oronasal groove from edge of upper lip to its anterior edge 2.95; length of snout 16.4; width across mouth 7.38; width of nasal flap 6.67; tip of snout to center of anus 56.2; anus to base of sting 32.4; anus to tip of sting 45.5; length of pelvics 12.6; anus to origin of the ventral fold of caudal fin 46.2; length of exposed part of sting 15.9; length of spiracle 3.95; greatest width of basal part of tail 8.10; snout tip to first gill slit 25.0; greatest height of caudal fin 3.19.

The following counts were made: Number of oblique rows of teeth from middle of jaw to outer edge, upper jaw 15, lower jaw 15; about 45 small spines along middle of back behind eyes and on middorsal side of tail.

Remarks.—This new species appears to be the Atlantic representative of *Urotrygon asterias* (Jordan and Gilbert) because it has in common with that species a characteristic and definite single row of enlarged spines along the middorsal line of the back and tail. *Urotrygon mundus* differs from *asterias* and *venezuelae* by not having the enlarged spines in a definite continuous row along the midline of the back; instead they are irregularly placed. Measurements made on the types of *U. asterias* are recorded along with those for *U. venezuelae* in table 1. It may be distinguished from *asterias* and from other American representatives of the genus *Urotrygon* by means of the key printed by Beebe and Tee Van (Zoologica, vol. 26, pt. 3, p. 264, 1941):

- 1a. A continuous series of greatly enlarged spines from behind orbits along midline of back and tail to base of sting; eye about 3.5 to 4 in snout (Pacific side of Central America).....**Urotrygon asterias** (Jordan and Gilbert)
 1b. Midline of back from behind orbits to just in front of base of tail with a very irregular series of slightly enlarged spines, these arranged in a continuous series on middorsal line of tail to base of sting; eye 5.7 in snout (Gulf of Venezuela).....**Urotrygon venezuelae**, new species

TABLE 1.—Measurements, expressed in hundredths of distance from tip of snout to tip of sting, made on two species of *Urotrygon*

Characters	<i>venezuelae</i>	<i>asterias</i>		
	Holotype	Types: U.S.N.M. Nos.—		
		29542	28204	29580
Total length in millimeters.....	255	299	413	361
Length in millimeters from snout tip to end of sting....	210	256	327	206
Greatest width of disk.....	65.7	65.6	69.1	68.6
Length of disk from snout tip to rear disk.....	61.7	62.5	64.6	62.1
Least interorbital space.....	6.90	6.84	6.46	6.54
Greatest distance between spiracles.....	11.4	10.7	11.3	10.8
Diameter of eye.....	2.86	3.24	3.83	3.98
Length of snout (tip to eye).....	16.4	16.6	15.0	14.1
Length of oronasal groove (to nasal flap).....	2.95	2.07	2.87	2.39
Width across lower jaw.....	7.38	6.37	6.24	6.54
Width of nasal flap.....	6.67	6.25	6.02	5.78
Length of pelvic fin (free outer edge).....	12.6	10.9	10.5	10.6
Length of sting.....	15.9	18.0	16.1	16.8
Snout tip to center of anus.....	56.2	53.5	59.6	54.6
Center of anus to: Rear base of sting.....	32.4	34.8	32.1	33.6
Tip of sting.....	45.5	46.8	43.1	46.0
Origin of ventral fold on tail.....	46.2	43.8	40.0	40.9
Least interspiracular space.....	8.57	8.60	8.56	8.40
Width of base of tail.....	8.10	6.06	7.34	7.52
Snout to front edge of first gill slit.....	25.0	25.1	23.5	22.6
Greatest height or width of caudal fin.....	3.19	2.93	2.91	2.94
Distance from first gill slit to last.....	9.38	9.69	10.9	9.80
Width of first gill slit.....	1.90	1.56	1.77	1.70
Width of last gill slit.....	1.48	1.41	1.22	1.31

Genus POTAMOTRYGON Garman

Potamotrygon GARMAN, Proc. Boston Soc. Nat. Hist., vol. 19, p. 210, 1877. (Genotype, *Pastinaca humboldtii* Roulin designated by Eigenmann, The freshwater fishes of British Guiana, p. 116, 1912.)

Pastinaca Swainson (Natural history of fishes, amphibians . . ., vol. 1, p. 172, 1838), is not a synonym of the genus *Potamotrygon* Garman, as Swainson says: "*Pastinaca* Antiq. differs from *Trygon* only in having the tail entirely naked: the common sting ray of the Mediterranean is the type of this genus, to which we prefer retaining the name by which it was known to the ancients." *Pastinacae* Nardo, Giorn. Fisica de Pavia, vol. 1, p. 11, 1827, with genotype *Raja pastinaca* Linnaeus, is an older name according to Jordan (Genera of fishes, pt. 1, p. 121, 1917).

I have had for examination, in addition to the series listed from the Maracaibo Basin, two specimens from the Orinoco system, two from the Río Ampiyacu of the Peruvian Amazon, and one from the Río Magdalena. On these I have based my key. Because of the variability in body proportions I considered it advisable not to use the measurements. The coloration is so strikingly different for the specimens from the three drainage basins that I am able to distinguish the three species at a glance. The presence or absence of white blotches or black spots on the dorsal surface was so variable for the large series of specimens from the Maracaibo Basin that I cast serious doubt on those characters as of value in distinguishing the species referable to the genus *Potamotrygon*.

For detailed measurements made on specimens of *Potamotrygon*, see table 2.

POTAMOTRYGON HUMBERTII (Duméril)

STINGRAY; RAYA DE AGUA DULCE

Pastenaque Humboldt, ROULIN, Ann. Sci. Nat., vol. 16, pp. 104-107, pl. 3, figs. 1-3, 1829 (Upper Río Meta, Province San Martín at Giramena). (No binomial name given.)

Pastin[aca] humboldtii, ROULIN, in Duméril, Histoire naturelle des poissons ou ichthyologie générale, vol. 1, p. 625, 1865.

Tacniura d'orbigny STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 159, 1879 (Ciudad Bolívar).

Trygon hystrix PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 473 (Apure, Venezuela).—SACHS, Aus dem Llanos, 1879, p. 146 (Apure).—RÖHL, Fauna descriptiva de Venezuela, p. 368, fig. 181, 1942 (Orinoco).

Potamotrygon hystrix EIGENMANN AND EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 25, 1891 (Apure; Orinoco).—(in part) FOWLER, Mus. Hist. Nat. Lima, 1945, p. 19 (Venezuela).

Potamotrygon d'orbigny (in part) EIGENMANN AND EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 25, 1891 (Orinoco, near Ciudad Bolívar).—EIGENMANN, Reports Princeton Univ. Exped. Patagonia 1896-1899, vol. 3, pt. 4, p. 378, 1910 (Apure of Orinoco).

TABLE 2.—Counts and measurements, expressed in hundredths of distance from tip of snout to tip of sting, made on species of *Potamotrygon*

Characters	<i>rugosulcatae</i> (Maracáibo Basin)										<i>hyster</i>	
	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂	♂	♀
Total length in millimeters.....	295	209	435	440	310	120	302	392	268	255	329	
Length in millimeters from tip of snout to end of sting.....	222	138	400	372	251	76	238	315	210	198	268	317
Greatest width of disk.....	57.7	54.4	53.7	54.3	53.8	60.5	54.6	54.3	52.4	57.6	64.6	62.2
Length of disk.....	63.0	59.1	60.0	60.2	60.6	65.1	61.0	58.8	60.0	62.6	66.0	64.6
Least interorbital space.....	8.56	9.06	7.50	7.26	7.57	10.5	7.78	7.30	7.62	7.58	7.94	8.67
Greatest distance between spiracles.....	12.8	13.0	11.5	11.6	12.0	15.1	11.8	11.7	12.4	12.1	11.7	12.1
Diameter of eye.....	3.15	3.62	3.00	2.95	3.19	3.55	3.36	3.40	3.82	4.75	3.46	3.94
Length of snout.....	16.2	15.9	14.0	14.3	15.5	16.5	15.5	14.0	15.2	16.4	17.2	15.8
Length of oronasal groove.....	4.50	3.62	5.00	4.04	4.38	3.95	4.41	4.13	4.28	4.04	3.95	4.10
Width across lower jaw.....	7.20	6.16	6.25	6.45	6.98	6.58	6.30	7.30	6.67	6.82	6.71	6.62
Width of nasal flap.....	6.98	6.08	5.75	5.92	6.48	5.92	5.46	5.88	6.20	6.36	6.27	6.52
Length of clasper.....					12.7	6.28	6.72	10.1	20.5	3.79	5.40	
Length of pelvic fin (free outer edge measured).....	15.3	13.1	13.8	15.6	15.9	13.7	15.1	13.3	15.7	12.1	14.9	14.5
Length of sting (from anterior dorsal base to tip).....	13.5	6.74	14.5	13.7	14.3		14.7	13.7	16.2	16.9	17.2	14.8
Snout to center of anus.....	53.2	50.8	51.0	51.0	52.2	57.9	51.3	51.1	49.5	53.0	53.7	56.1
Center of anus to: Rear base of sting.....	39.4	41.3	36.5	39.8	37.5	44.1	37.8	41.0	37.6	33.6	33.2	35.0
Tip of sting.....	47.3	47.8	46.0	46.8	47.8		48.0	49.0	49.0	46.7	46.0	47.8
Origin of ventral fold on tail.....	34.2	36.2	34.0	35.0	33.2	36.8	33.6	36.8	34.3	28.8	31.0	30.8
Number of oblique rows of teeth on upper jaw.....	23		21	30	23		22	26	22	18	20	15
Number of enlarged spines along middorsal line of tail.....	10	None	22	13	10	None	11	15	2	17	20	18+

1 Río Guárico and Apure, respectively.

2 Río Amipacú, Peru.

One specimen, 255 mm. in total length, Río Guárico at El Sombrero, F. F. Bond, February 13, 1938.

One specimen, 329 mm. in total length, Río Apure at San Fernando de Apure, F. F. Bond, February 16, 1938.

POTAMOTRYGON MAGDALENÆ (Duméril)

STINGRAY; RAYA DE AGUA DULCE

FIGURE 3

Taeniura magdalenæ VALENCIENNES, in Duméril, Histoire naturelle des poissons ou ichthyologie générale, vol. 1, p. 625, 1865 (Río Magdalena).

Trygon hystrix (in part) MÜLLER AND HENLE, Systematische Beschreibung der Plagiostomen, p. 167, 1841 (Maracaibo).

Trygon (Trygon) hystrix (in part) DUMÉRIL, Histoire naturelle des poissons ou ichthyologie générale, vol. 1, p. 608, 1865 (L. Maracaibo).

Potamotrygon hystrix (in part) CAPORIACCO, Mon. Zool. Ital., vol. 46, No. 3, p. 56, 1935 (Maracaibo).

Potamotrygon magdalenæ SCHULTZ, U. S. Naval Med. Bull., vol. 42, No. 3, p. 752, 1944 (Sinamaica, Venezuela).

U.S.N.M. No. 121665, 2 specimens, one, a female, 325 mm. in total length, gave birth to a postembryo 186 mm. in total length, Lago Tulé, about 75 km. west of Maracaibo, March 1, 1942.

U.S.N.M. No. 121659, 5 specimens, all males, 184 to 302 mm., Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21, 1942.

U.S.N.M. No. 121667, 5 specimens, ♂ 123 (postembryo) to 348 mm.; ♀ 330 and 450 mm., Río Negro below mouth of Río Yasa, March 2, 1942.

U.S.N.M. No. 121666, 2 specimens, ♂ 260 and ♀ 312 mm., Ciénaga del Guanavana, about 10 km. north of Sinamaica, March 11, 1942.

U.S.N.M. No. 121661, 1 specimen, ♂ 310 mm., Río Agua Caliente, 2 to 3 km. above Lago de Maracaibo, May 1, 1942.

U.S.N.M. No. 121662, 4 specimens, 2 embryos, ♂ 120 and ♀ 127 mm., ♂ 338 and ♀ 440 mm., Río Palmar at bridge, 70 km. southwest of Maracaibo, March 6, 1942.

U.S.N.M. No. 121668, 9 specimens, ♂ 175 to 445 and 2 ♀ 202 and 235 mm., Río Apón, about 35 km. south of Rosario, February 26, 1942.

U.S.N.M. No. 121664, 5 specimens, embryos ♂ 205 and 230 mm., ♀ 195 and 209 mm., and adult ♀ 435 mm., Lago de Maracaibo near mouth of Río Concha, May 2, 1942.

U.S.N.M. No. 121660, 5 specimens, ♀ 158 to 295 mm., and one ♂ 325 mm. Río Machango at bridge south of Lagunillas, March 16, 1942.

U.S.N.M. No. 121663, 2 specimens, ♂ 302 and 392 mm., caño ½ mile west Sinamaica, March 11, 1942.

This species of stingray occurs abundantly in the rivers, ponds, caños, and lakes of the Maracaibo Basin on sandy to muddy bottoms, where it partially conceals itself by burying itself in the bottom. In this position it is a dangerous fish because when it is stepped on it can drive its poisonous sting with great force into a person's foot or leg. The Venezuelans greatly fear it because its sting not only produces excruciating pain but may cause death. The largest stingray that I saw was a female in the Río Machango. It measured a little over a foot across the disk.

This stingray does not appear to have been described very fully in the past, and for that reason the following descriptive comments are recorded, along with measurements in table 2.

The disk is a little longer than wide, evenly rounded; the tip of the snout has a little soft knoblike projection beyond the outline of the disk; the tail is longer than length of the disk, although the end of the tail is almost invariably missing except on the embryos, and therefore *total length means very little*; spiracles about size of eye and located just behind eyes; the space between the spiracles greater than inter-

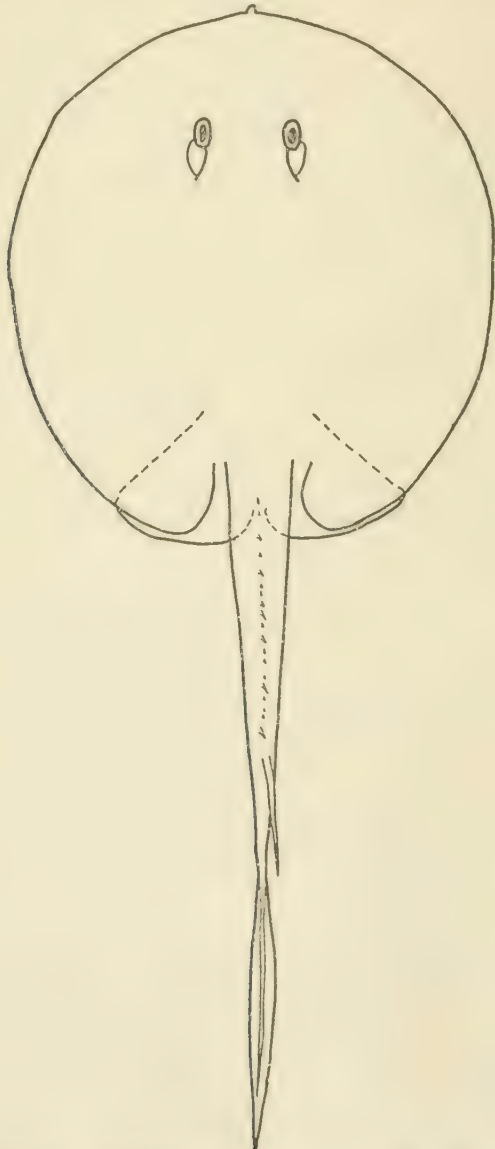


FIGURE 3.—*Potamotrygon magdalenae* (Duméril) (U.S.N.M. No. 121665), 325 mm. in total length, from Lago Tulé. Sketch by author.

orbital space, the latter about twice the length of the snout, interorbital space nearly flat; the mouth is a little closer to tip of snout than to front of the eye; inside the mouth there are always five blunt papillae on the lower jaw behind the teeth, the papilla in the midline a little in advance of the others, all four of which are in a straight line or nearly so; behind the teeth of upper jaw is a broad membrane whose inner margin has about 25 lappets; the nasal flap is free with a truncate fringed margin; the teeth are diamond-shaped with a posteriorly projecting blunt median tip, each side of which is a slight concavity; the greatest width of the toothed area of the upper jaw about two-thirds that of lower jaw; pelvic fins when spread with outer margins truncate or a little rounded, outer tips rounded; the claspers are variously developed at different sizes, the smallest specimen with fully developed claspers measures 210 mm. from tip of snout to end of sting and the diameter of the clasper was about 10 mm., its length 43 mm.; the spines along middorsal line of back in front of base of sting are absent on the embryos and postembryos but begin to appear at a length of about 200 mm. (from snout tip to end of sting) and the greatest number of such spines counted was 23; the sting when fully developed is about as long as the snout, fully barbed along its sides and with a lengthwise groove near base of the barbs that no doubt contains the poison glands and venom; the upper surfaces of the body are covered with minute scales and then in addition some specimens have numerous to few scattered stellate tubercles; under side of body naked.

Color.—Dorsal surface plain dark brown or dark brown with numerous scattered small black spots, and occasionally the dorsal surface has light blotches; ventral surface plain pale except rayed parts of pectorals, which are grayish to brownish, more intense around the margins, and sometimes a few black spots occur near margins of the disk; outer corners of upper lip sometimes darkish; under side of tail blotched or mottled; tail of young and postembryos somewhat faintly barred. When alive the under sides were purplish to pinkish.

Frequently when a female ray was placed in the collecting can it would give birth to one to four embryos.

Family MYLIOBATIDAE: Eagle and Cow-nosed Rays

This family may be recognized by the pectoral fins not being continuous to the end of the snout. They end on the side of the head behind the eyes, reappearing again in the front of the snout as one or two fleshy protuberances. The pectoral fins are pointed distally and the tail is long and whiplike with a spine basally.

Genus RHINOPTERA Kuhl

Rhinoptera KUHL, in Cuvier, Le règne animal, ed. 2, vol. 2, p. 401, 1829. (Genotype, *Myliobatis marginatus* Geoffroy.) (Ref. copied.)

RHINOPTERA LALANDII Müller and Henle

COW-NOSED RAY

Rhinoptera lalandii MÜLLER and HENLE, Systematische Beschreibung der Plagiostomen, p. 182, 1841 (Brazil).

U.S.N.M. No. 123216, 1 specimen, 1,030 mm. in total length with length of disks 360 mm., Piedras Bay, U. S. S. *Niagara*, March 14, 1925.

U.S.N.M. No. 123219, head only, Amuay Bay, U. S. S. *Niagara*, May 15, 1925.

Genus AETOBATUS Blainville

Actobatus BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 120, 1816. (Genotype, *Raja narinari* Euphrasen, designated by Gill.) (Ref. copied.)

AETOBATUS NARINARI (Euphrasen)

EAGLE RAY; CHUCHO

Raja narinari EUPHRASEN, Handl. Vet.-Akad. Stockholm, vol. 11, p. 217, pl. 10, 1790 (St. Bartholomieu, West Indies.) (Ref. copied.)

Actobatus narinari ROHL, Fauna descriptiva de Venezuela, p. 369, fig. 182, 1942 (coast of Venezuela).

U.S.N.M. No. 123218, small head, Amuay Bay, U. S. S. *Niagara*, May 15, 1925.

Family MOBULIDAE

Genus MANTA Bancroft

Manta BANCROFT, Zool. Journ., vol. 4, p. 144, 1828-29. (Genotype, *Cephalopterus manta* Bancroft.)

MANTA BIROSTRIS (Walbaum)

DEVILRAY; MANTA

Raja birostris WALBAUM, Artedi's Bibliotheca ichthyologica, vol. 3, p. 535, 1792 (on *Diabolus marinus* Willughby).

Manta birostris RÖHL, Fauna descriptiva de Venezuela, p. 370, 1942 (coast of Venezuela).

This giant ray may be recognized by the presence of a pair of fleshy hornlike projections from the front of the snout that turn inward. The eyes occur laterally near the outer base of each of the two fleshy cephalic projections.

Suborder NARCOBATOIDEA

Family TORPEDINIDAE: Electric Rays; Tembladores

This family of rays has a disk-shaped body that tapers posteriorly to a blunt thickish caudal fin; there are two small dorsal fins but no "sting" or spine on the tail. The disk-shaped part of the body lateral to and behind the eye is supplied with an electric gland capable of giving a powerful electric shock when it is touched.

Genus **NARCINE** Henle

Narcine HENLE, Über *Narcine*, pp. 2, 31, 1834. (Genotype, *Torpedo brasiliensis* von Ölfers.) (Ref. copied.)

NARCINE BRASILIENSIS (Ölfers)

ELECTRIC RAY; TEMBLADOR DE AGUA SALADA

Torpedo brasiliensis ÖLFERS, Die Gattung *Torpedo*, p. 19, pl. 2, fig. 4, 1831 (Brazil).
Narcine brasiliensis RÖHL, Fauna descriptiva de Venezuela, p. 370, fig. 183, 1942
 (coast of Venezuela; ? Río Mazanares).

Class **OSTEICHTHYES**

Subclass **ACTINOPTERYGII**

Superorder **TELEOSTEI: Bony Fishes**

This class includes the bony fishes, which have hard bones as contrasted with the elasmobranch fishes with a cartilaginous skeleton. There is but a single external gill opening, the gills being covered by an operculum.

Order **ISOSPONDYLIOIDEA**

Suborder **CLUPEOIDEA**

Family **ELOPIDAE: Tarpons**

KEY TO THE GENERA AND SPECIES REPORTED FROM VENEZUELA

- 1a. Scales about 42 or 43; gill rakers very numerous; dorsal branched rays about 10 or 11; anal branched rays about 18 or 19; last ray of dorsal fin filamentous.....**Tarpon atlanticus** (Cuvier and Valenciennes)
- 1b. Scales small, 103 to 120 from upper edge of gill opening to midcaudal fin base; gill rakers on first gill arch 5 to 8+10 to 15; branched dorsal rays 17 to 20; branched anal rays 11 to 13; last dorsal fin ray not filamentous.

Elops saurus Linnaeus

Genus **TARPON** Jordan and Evermann

Tarpon JORDAN AND EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, p. 409, 1896.
 (Genotype, *Megalops atlanticus* Cuvier and Valenciennes.)

TARPON ATLANTICUS (Cuvier and Valenciennes)

TARPON; SÁBALO

Megalops atlanticus CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 19, p. 398, 1846 (Guadeloupe; San Domingo; Martinique; Porto Rico).
Tarpon atlanticus RÖHL, Fauna descriptiva de Venezuela, p. 373, fig. 184, 1942
 (coast of Venezuela).

Several specimens were seen rolling and diving in the Río Concha about 4 or 5 km. above Lago de Maracaibo. A large school was reported in Lago de Maracaibo at its northern end during April 1942.

Genus **ELOPS** Linnaeus

Elops LINNAEUS, *Systema naturae*, ed. 12, vol. 1, p. 518, 1766. (Genotype, *Elops saurus* Linnaeus.)

ELOPS SAURUS Linnaeus

MACABÍ

Elops saurus LINNAEUS, *Systema naturae*, ed. 12, vol. 1, p. 518, 1766 (Carolina).

U.S.N.M. No. 121694, 6 specimens, 113 to 127 mm. in standard length, Salina Rica, 5 km. north of Maracaibo, in brackish water, February 20, 1942.

U.S.N.M. No. 121695, 1 specimen, 107 mm., Lago de Maracaibo at Maracaibo Yacht Club, February 27, 1942.

U.S.N.M. No. 121696, 1 specimen, 385 mm., Río Concha near mouth, May 2, 1942.

U.S.N.M. No. 121697, 3 specimens, 194 to 222 mm., Macolla Point, U. S. S. *Niagara*, April 19, 1925.

2 specimens, 22.5 and 57 mm., a bajo seco, east side of Puerto Cabello, F. F. Bond, January 26, 1938.

1 specimen, 28 mm., lagoons at Tucacas, 60 km. northwest of Puerto Cabello, F. F. Bond, January 29, 1938.

2 specimens, 19.5 and 20 mm., Río Barburata at mouth, Puerto Cabello, F. F. Bond, January 19, 1938.

Family **ALBULIDAE**: Ladyfishes

KEY TO THE GENERA AND SPECIES REPORTED FROM VENEZUELA

1a. Last dorsal and anal rays not elongate.-----**Albula vulpes** (Linnaeus)

1b. Last dorsal and anal rays exceedingly prolonged.**Dixonina nemoptera** Fowler

Genus **ALBULA** Scopoli

Albula SCOPOLI, *Natural history of fishes*, p. 454, 1777. (Genotype, *Esox vulpes* Linnaeus.)

ALBULA VULPES (Linnaeus)

BONEFISH; MACABÍ

Esox vulpes LINNAEUS, *Systema naturae*, ed. 10, p. 313, 1758 (Bahamas).

Albula vulpes RÖHL, *Fauna descriptiva de Venezuela*, p. 373, fig. 185, 1942 (coast of Venezuela).

U.S.N.M. No. 128265, 4 larval specimens, 33 to 44 mm. in standard length, Cape San Román, U. S. S. *Niagara*, April 2, 1925.

U.S.N.M. No. 128267, 1 specimen, 37 mm., Estanques Bay, U. S. S. *Niagara*, February 20, 1925.

Genus **DIXONINA** Fowler

Dixonina FOWLER, *Proc. Acad. Nat. Sci. Philadelphia*, 1910, p. 652. (Genotype, *Dixonina nemoptera* Fowler.)

DIXONINA NEMOPTERA Fowler

Dixonina nemoptera FOWLER, *Proc. Acad. Nat. Sci. Philadelphia*, 1910, p. 652 (Santo Domingo).—MYERS, *Copeia*, 1936, No. 2, p. 83 (Puerto Cabello [not

Curacao [but Venezuela].—BEEBE, Zoologica, vol. 27, No. 8, p. 43, 1942 (Puerto Cabello).

Albula nemoptera METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 9, 1919 (Puerto Cabello).

Family CLUPEIDAE: Herrings; Sardines

Since there were not many specimens of this family in the collections from Venezuela I have not made a critical study of them. The key to the genera of Clupeidae reported from Venezuela was extracted from Storey (Stanford Ichthyol. Bull., vol. 1, No. 1, p. 14, 1938). Those who wish to identify the species in the genus *Harengula* should consult Storey (loc. cit.), pp. 24-25.

1a. Anal fin short, of fewer than 30 rays or the mouth is inferior; no distinct median notch in upper jaw.

2a. A bilobed dermal fold on anterior edge of cleithrum.

3a. Last 2 rays of anal fin much enlarged, almost forming separate finlets, third from last smaller than the one preceding it.

Sardinella Valenciennes

3b. Last 2 rays of anal fin scarcely enlarged, third from last not smaller than one preceding it; last ray of dorsal not produced.

Harengula Valenciennes

2b. No bilobed dermal fold on anterior edge of cleithrum; body strongly compressed; scales on base of caudal lobes; one pointed retrorse spine near proximal end of maxillary.....*Rhinosardinia* Eigenmann

1b. Anal fin long, of more than 32 rays; mouth never inferior.

4a. Pelvic fins absent; maxillary not adherent to premaxillary; no canines; anal origin in front of dorsal origin; maxillary tapering behind in adults extending to gill opening or beyond, but with rounded posterior end in the young at a standard length of about 40 mm. or shorter.

Odontognathus Lacepède

4b. Pelvic fins present.

5a. Maxillary adherent to premaxillary; canines present.

Chirocentrodon Günther

5b. Maxillary not adherent to premaxillary; no canines.—*Neosteus*⁶ Norman

Genus SARDINELLA Valenciennes

Sardinella VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 20, p. 261, 1847. (Genotype, *Sardinella aurita* Valenciennes, designated on p. 263, loc. cit.)

SARDINELLA ANCHOVIA Valenciennes

SARDINA

Sardinella anchovia VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 20, p. 269, 1847 (Rio de Janeiro, Martinique).

The collection bearing U.S.N.M. No. 77962, 4 specimens, 96 to 138 mm. in standard length, made by H. B. Ritchie at Pompat, Margarita Island, appears to consist of market fish of this species. They are in bad condition, having had all gill arches and viscera removed.

⁶ Not yet reported from Venezuela but undoubtedly occurring there.

Genus HARENGULA Valenciennes

Harengula VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 20, p. 277, 1847. (Genotype, *Harengula latulus* Valenciennes, designated on pp. 277, 281, loc. cit.)

For the identification of the species of *Harengula* see Storey's key (Stanford Ichthyol. Bull., vol. 1, No. 1, pp. 24-25, 1938).

HARENGULA CLUPEOLA (Cuvier)**SARDINE; SARDINA**

Clupea clupeola CUVIER, Le règne animal, ed. 2, vol. 2, p. 318 footnote 2, 1829.

The following specimens were collected by the U.S.S. *Niagara* in the Gulf of Venezuela:

U.S.N.M. No. 128276, 5 specimens, 60 to 72 mm. in standard length, Amuay Bay, December 9, 1924.

U.S.N.M. No. 128277, 2 specimens, 32 and 57 mm., Jacuque Point, January 26, 1925.

U.S.N.M. No. 128279, 7 specimens, 45 to 56 mm., Salinas Bay, April 4-5, 1925.

U.S.N.M. No. 128278, 4 specimens, 32 to 38 mm., Estanques Bay, February 20, 1925.

HARENGULA MAJORINA Storey

Harengula majorina STOREY, Stanford Ichthyol. Bull., vol. 1, No. 1, pp. 25, 32, figs. 9, 12, 17, 1938 (Santos and Province of São Paulo, Brazil; St. Lucia, B. W. I.).

U.S.N.M. No. 128280, 4 specimens, 52 to 54.5 mm. in standard length, Salinas Bay, U.S.S. *Niagara*, April 4-5, 1925.

U.S.N.M. No. 128281, a specimen, 141 mm., is probably this species, taken in Estanques Bay, U.S.S. *Niagara*, December 8, 1924.

Genus RHINOSARDINIA Eigenmann

Rhinosardinia EIGENMANN, Mem. Carnegie Mus., vol. 5, p. 445, 1912. (Genotype, *Rhinosardinia serrata* Eigenmann.)

RHINOSARDINIA AMAZONICA (Steindachner)

Clupea amazonica STEINDACHNER, Sitzb. Akad. Wiss. Wien, vol. 80, p. 65, 1879 (Amazon River at Pará).

Rhinosardinia amazonica FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 466, 1931 (Caño de Guanoco and Punta Tigre at mouth of San Juan River, Venezuela).

Genus ODONTOGNATHUS Lacepède

Odontognathus LACEPÈDE, Histoire naturelle des poissons, vol. 2, p. 221, 1800. (Genotype, *Odontognathus muricatus* Lacepède.)

ODONTOGNATHUS COMPRESSUS Meek and Hildebrand

Odontognathus compressus MEEK AND HILDEBRAND, Marine fishes of Panama, vol. 1, p. 194, pl. 11, fig. 2, 1923 (Fox Bay, Colon, Panama).

The following collections were made by the U.S.S. *Niagara* in the Gulf of Venezuela in 1925:

U.S.N.M. No. 128284, 6 specimens, 38 to 53 mm., in standard length, April 4.

U.S.N.M. No. 128285, 19 specimens, 25 to 105 mm., Jacuque Point, January 26.

U.S.N.M. No. 128282, 2 specimens, 67.5 and 68 mm., Cape San Román, April 2.

U.S.N.M. No. 128283, 9 specimens, 38.5 to 93 mm., Point Macolla, April 19.

Genus CHIROCENTRODON Günther

Chirocentrodon GÜNTHER, Catalogue of the fishes in the British Museum, vol. 7, pp. 382, 463, 1868. (Genotype, *Chirocentrodon taeniatulus* Günther.)

CHIROCENTRODON BLEEKERIANA (Poey)

Pellona bleekeriana POEY, Repertorio fisico-natural de la isla de Cuba, vol. 2; p. 242, 1867 (Cuba).

U.S.N.M. No. 128275, 1 specimen, 50 mm. in standard length, from Point Macolla, Gulf of Venezuela, U.S.S. *Niagara*, April 19, 1925, was identified by Dr. Hildebrand.

Family ENGRAULIDAE: Anchovies; Anchoas

The recent excellent revision of this family by Dr. S. F. Hildebrand (Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, 1943) was indispensable in this study of the anchovies of Venezuela. During the several years that Dr. Hildebrand was preparing this revision he assembled in the U. S. National Museum one of the most complete collections of American anchovies to be found in any museum, including numerous types, cotypes, and paratypes. It gave me considerable pleasure to be able to add several thousand more specimens to this collection, among which were six known species and four undescribed ones, all collected by me in Venezuela during 1942.

I have followed Dr. Hildebrand's treatment of the Engraulidae to a large extent, deviating, however, in the anal-fin formula. Since the first three anal rays are unbranched I have represented them by lower-case Roman numbers followed by Arabic numerals for the branched rays, thus: iii,24. The first pectoral rays consist of two simple ones, followed by branched rays, the first pectoral ray being of paper thinness and lying close to the second. The dorsal consists of a minute simple ray, then two larger ones, followed by branched rays.

The following key to the genera of Engraulidae reported from Venezuela is somewhat modified from Dr. Hildebrand's in order to call attention to the greatly coiled condition of the intestine in *Cetengraulis*. *Engraulis* is omitted, since it has not as yet been found in Venezuela.

1a. Intestine with one main loop, without numerous coils below air bladder; gill membranes never broadly united across the isthmus, at most only a narrow delicate membrane anteriorly.

2a. Teeth in the jaws all small or minute, about equal in size.

3a. Origin of anal fin posterior to origin of dorsal fin, very rarely almost under it; gill rakers long, narrow, and numerous; body compressed, except in young; vertebrae 37 to 46, rarely 46.

- 4a. Maxillary long and slender, generally reaching well beyond joint of mandible, frequently nearly or quite to margin of opercle, more or less sharply pointed posteriorly.
- 5a. Gill rakers very close set, numerous, increasing in number with age, about 60 to 130 on lower limb of first arch in adults, as few as 35 or 40 in young; body deep, strongly compressed, depth in adults about 2.6 to 3.8 in standard length; attaining a standard length of 250 mm.-----**Anchovia** Jordan and Evermann
- 5b. Gill rakers not very close set, less numerous, apparently not increasing in number with age, rarely as many as 32 on lower limb of first arch; body usually more elongate; some species very small, size not exceeding 150 mm. in standard length.
Anchoa Jordan and Evermann
- 4b. Maxillary shorter, often rather broad, usually failing to reach joint of mandible, never reaching beyond it, square or broadly rounded posteriorly, never pointed; not exceeding 150 mm. in standard length.-----**Anchoviella** Fowler
- 3b. Origin of anal fin in advance of origin of dorsal fin, or rarely under it; pelvic fin inserted about equidistant from base of pectoral and origin of anal.
- 6a. Origin of dorsal fin notably less than twice as far from tip of snout as from base of caudal; gill rakers short and broad, only about 14 on lower limb of first arch; anal with 29 to 33⁷ rays.
Pterengraulis Günther
- 6b. Origin of dorsal fin about twice as far from tip of snout as from base of caudal; gill rakers long, slender, and numerous, about 33 on lower limb of first arch in young (probably more numerous in adults); anal with about 25 rays.-----**Hildebrandichthys**, new genus
- 2b. Teeth in the jaws, especially in the lower jaw, notably enlarged, usually unequal in size; origin of anal posterior to that of dorsal; pelvic inserted about midway between base of pectoral and origin of anal; size attained large, about 250 to 300 mm. in total length.
Lycengraulis Günther
- 1b. Intestine black, greatly coiled in posterior part of abdominal cavity, pyloric caeca black; gill membranes broadly united across isthmus in adults by a thin membrane, easily torn; gill rakers long and slender, close set, increasing in number with age, 25 to 60 on lower limb of first arch; pelvic fin insertion under or only a little in advance of dorsal origin, size attained up to at least 160 mm.-----**Cetengraulis** Günther

Genus ANCHOVIA Jordan and Evermann

Anchovia JORDAN AND EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, p. 449, 1896.
(Genotype, *Engraulis macrolepidotus* Kner and Steindachner).

KEY TO THE SPECIES OF ANCHOVIA FROM VENEZUELA

- 1a. Origin of anal fin well in advance of a vertical line through middle of dorsal fin base; vertebrae 42 or 43; length of cheek about equal to snout and eye; pelvic fin inserted about equidistant from pectoral insertion and a vertical line through dorsal origin and of anal origin; greatest depth 3.3 to 3.7, and postorbital length of head 5.4 to 6.4, both in standard length; anal rays iii, 27 to iii, 32.-----**Anchovia clupeioides** (Swainson)

⁷ Dr. Hildebrand gives the range 27 to 35, but he informs me that the 27 is a typographical error and should be 29 as in his original data.

- 1b. Origin of anal fin nearly under middle of base of dorsal fin; vertebrae 39 to 41; length of cheek notably longer than snout and eye; pelvic fin insertion notably closer to a vertical line through dorsal origin than insertion of pectorals and nearer base of pectoral than anal origin; depth 3.5 to 4.2 and postorbital length of head 5.2 to 5.6 in standard length.

Anchovia nigra, new species

ANCHOVIA CLUPEOIDES (Swainson)

Engraulis clupeioides SWAINSON, The natural history and classification of fishes, vol. 2, p. 388, 1839 (Pernambuco, Brazil).

Engraulis productus TORTONESE, Bol. Mus. Zool. Anat. Comp. Univ. Torino, vol. 47, No. 89, p. 6, 1939 (Puerto Cabello, Venezuela).

Anchovia clupeioides HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 27, fig. 9, 1943 (Venezuela).

U.S.N.M. No. 121767, 60 specimens, 52 to 118.5 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, Gulf of Venezuela, March 12, 1942.

U.S.N.M. No. 127552, 2 specimens, 47 to 50 mm. in standard length, south coast Gulf of Venezuela, U.S.S. *Niagara*, November 15, 1925.

3 specimens, 72 to 81 mm., Laguna de Tacarigua, Estado de Miranda, F. F. Bond, November 11, 1939.

ANCHOVIA NIGRA, new species

ANCHOA

FIGURE 4

Holotype.—U.S.N.M. No. 121761, 97 mm. in standard length, collected by Leonard P. Schultz in Lago de Maracaibo at Yacht Club, Maracaibo, Venezuela, February 27, 1942.

Paratypes.—All the paratypes were collected by Leonard P. Schultz in the Maracaibo Basin during 1942:

U.S.N.M. No. 121764, 3 specimens, 41 to 99.5 mm., from Lago de Maracaibo, 1 km. off Pueblo Viejo, April 7–8.

U.S.N.M. No. 121762, a specimen, 61 mm., Río Agua Caliente, 2 to 3 km. above Lago de Maracaibo, May 1.

U.S.N.M. No. 121763, 4 specimens, 39.5 to 51.5 mm., Lago de Maracaibo at Yacht Club, May 16.

U.S.N.M. No. 121766, 2 specimens, 81 and 92 mm., from Lago de Maracaibo near mouth of Río Concha, May 2.

U.S.N.M. No. 121765, 7,000 specimens, 12 to 66 mm., Río de Los Pájaros, 3 km. above Lago de Maracaibo, April 30.

A female at 99.5 mm. in standard length had her abdomen crowded with mature eggs on April 7–8, indicating that spawning time was near.

Description.—Certain measurements were made, and these data, recorded below, are expressed in hundredths of the standard length, first for the holotype, then for three paratypes in parentheses, respectively. Standard lengths in millimeters 97 (97.6; 55.5; 92).

Length of head 29.9 (31.3; 30.6; 30.5); greatest depth of body 28.9 (27.2; 26.1; 26.1); length of snout 4.64 (4.71; 4.50; 4.89); diameter of

eye 7.52 (8.20; 8.29; 8.05); distance from tip of lower jaw to rear of joint of mandible 20.1 (22.1; 20.5; 21.2); distance from tip of snout to rear of maxillary 22.5 (25.6; 25.6; 25.6); greatest width of interorbital space 7.02 (7.17; 7.57; 7.18); postorbital length of head 19.2 (19.1; 18.0; 19.1); length of cheek 13.8 (13.2; 12.2; 13.0); length of longest gill raker on first gill arch 6.70 (8.00; 6.84; 8.15); length of longest ray of dorsal fin — (13.2; 15.5; 14.6); of anal fin 12.5 (—; 13.9; 13.3); of pectoral fin 14.4 (14.3; 16.6; 14.9); of pelvic fin 7.22 (6.97; 8.10; 7.28); of lower lobe of caudal fin 23.4 (26.6; 26.1; 26.7); shortest midcaudal fin ray 9.28 (8.91; 11.7; 9.13); length of base of anal fin 27.7 (26.8; 30.1; 28.5); length of base of dorsal fin 11.3 (12.5; 11.0; 10.9); distance from pelvic insertion to anal origin 17.5 (18.5; 15.1; 16.3); tip of snout to dorsal origin 52.6 (56.3; 53.3; 52.6); snout to anal origin 60.3 (62.0; 56.6; 62.0); snout to pectoral insertion 30.0 (30.7; 30.6; 31.0); snout to pelvic insertion 44.6 (46.1; 42.9; 46.2); length of caudal peduncle or distance from base of last anal ray to midcaudal fin base 16.5 (15.4; 16.4; 15.4); least depth of caudal peduncle 11.2 (10.8; 11.7; 11.2).



FIGURE 4.—*Anchovia nigra*, new species: Holotype (U.S.N.M. No. 121761), 97 mm. in standard length. Drawn by Mrs. Aime M. Awl.

The following counts were made, respectively: Dorsal rays iii, 11 (iii, 11; iii, 11; iii, 11); anal rays iii, 28 (iii, 27; iii, 28; iii, 29); pectoral fin rays ii, 12–ii, 12 (ii, 12–ii, 12; ii, 11–ii, 12; ii, 11–ii, 11); pelvic rays always i, 6; scale rows from upper edge of gill opening to midcaudal fin base 42 (41; 44; 43). Additional counts are recorded in table 3.

TABLE 3.—Counts made on species of *Anchovia* from Venezuela

Species	Number of anal fin rays								Number of vertebrae				
	iii, 25	iii, 26	iii, 27	iii, 28	iii, 29	iii, 30	iii, 31	iii, 32	39	40	41	42	43
<i>clupeoides</i>			1	2	3	8	3	1				11	5
<i>nigra</i>	1	8	8	9	2				2	11	3		

Body compressed, deep, greatest depth about 3.5 to 4.2, and head about 3.3 to 3.5, both in standard length; depth of head at joint of mandible much less than postorbital length of head; head longer than greatest depth of body; snout bluntly pointed, projecting more than half its length beyond mandible, shorter than eye, scarcely longer than pupil, contained $5\frac{1}{4}$ to $5\frac{3}{4}$ in head; eye 3.4 to 4.2 in head; maxillary ending in a triangular point, extending to or a little past joint of mandible, contained about 1.3 or 1.4 in head; mandible pointed, not curved upward at tip, reaching a vertical line through rear edge of posterior nostril when mouth is closed; teeth most minute but very numerous along edges of both jaws, often obsolete in adults; cheek 6.6 to 7.1 and postorbital length of head 5.2 to 5.6 in standard length; gill rakers very long and slender and very numerous, increasing in number with increase in length or age; depressed length of dorsal fin 1.5 to 2 in head; the first branched rays of dorsal fin reaching a little past tips of last rays when the fin is depressed; distal margin of dorsal fin truncate or a little concave; caudal fin deeply forked; distal margin of anal fin a little concave, first anal rays longest; first upper ray of pectoral fin longest, tips of pectoral fins reaching past the insertion of pelvics, sometimes to opposite nearly halfway toward tips of pelvics in young specimens; pelvic fins reaching halfway to anal origin in young but scarcely halfway to anus in adults; dorsal fin origin equidistant between midcaudal fin base and front half of eye; origin of anal fin under middle of base of dorsal fin; axillary scale of pectoral extending out about halfway to tip of pectoral fin; intestine with one main loop.

Coloration.—In alcohol the adults are straw-colored dorsally, silvery on sides, with a dark brownish streak along middorsal line of back; inside of gill cavity blackish ventrally opposite region of maxillary; all fins translucent-whitish except caudal fin, which is dusky with the black pigment cells more intense on distal part of rays; peritoneum silvery but intestine blackish. In the young a silvery lateral band about as wide as eye anteriorly becomes narrower posteriorly. The most characteristic mark is a small black speck at lower base of caudal fin, with a small cross of X-shaped lines of black pigment more or less embedded; base of anal fin with black pigment spots; tip of snout blackish; middle basal part of each lobe of caudal fin more intensely pigmented than remainder of caudal fin; otherwise coloration is similar to that in adult specimens.

Remarks.—This new species would, with some exceptions, trace down through Dr. Hildebrand's key (1943, p. 21) to *A. rastralis*, but it differs from that Pacific species in having 39 to 41 (usually 40) vertebrae instead of 41 or 42. From *A. clupeioides* it may be separated by the key on page 38. Named *nigra* in reference to the black pigmentation on inside of the gill cavity.

Genus *ANCHOA* Jordan and Evermann

Anchoa JORDAN AND EVERMANN, Proc. California Acad. Sci., ser. 4, vol. 16, No. 15, p. 501, 1927. (Genotype, *Engraulis compressus* Girard.)

KEY TO THE SPECIES OF *ANCHOA* REPORTED FROM VENEZUELA¹

1a. Anal fin with iii, 14 to iii, 22 rays.

2a. Gill rakers on lower limb usually 16 to 26, and upper limb 13 to 21.

3a. Origin of anal under middle or a little behind middle of base of dorsal fin; cheek short and broad, usually not much longer than eye; depth about 5.0 to 5.75 and postorbital length of head 6.3 to 6.9, both in standard length; maxillary short, reaching only to joint of mandible, not sharply pointed, 1.3 to 1.5 in head; anal rays iii, 15 to iii, 19.

Anchoa ginsburgi Hildebrand

3b. Origin of anal fin far behind middle of base of dorsal fin, somewhere under its posterior third and rarely behind base of dorsal; cheek longer and narrower, generally notably longer than eye; anal rays iii, 17 to iii, 22; dorsal fin when depressed usually with first rays extending to or beyond tip of last depressed ray; depth 5.0 to 6.0 in standard length; origin of anal under or slightly behind base of last dorsal ray; silvery lateral band as wide as eye. *Anchoa lyolepis* (Evermann and Marsh)

2b. Gill rakers 22 to 33 on lower limb and 17 to 23 on upper limb of first arch.

4a. Origin of anal generally under posterior third of base of dorsal fin; cheek short and broad, scarcely longer than eye; axillary scale of pectoral about $\frac{3}{4}$ length of that fin and 1.9 to 2.7 in head; dorsal origin about equidistant between midcaudal fin base and middle of eye; maxillary not sharply pointed posteriorly, its upper free margin rounded, reaching to or slightly beyond joint of mandible; anal rays iii, 15 to iii, 19; gill rakers 18 to 22 + 24 to 28. *Anchoa tricolor* (Agassiz)

4b. Origin of anal about under middle of dorsal fin base, sometimes slightly behind middle; depth 4.5 to 5.0, anal base 3.8 to 4.8, both in standard length; maxillary long, sharply pointed, extending nearly to margin of opercle except in the young, 1.2 to 1.35 in head; gill rakers 17 to 20 + 23 to 27; anal rays iii, 18 to iii, 22.

Anchoa parva (Meek and Hildebrand)

1b. Anal rays iii, 23 to iii, 37; gill rakers on first gill arch 14 to 19 + 16 to 22; anal fin base 2.8 to 3.4 in standard length; axillary scale of pectoral broad reaching nearly to or a little past midlength of that fin, 2.4 to 3.6 in head.

5a. Origin of dorsal fin notably closer to midbase of caudal fin than to tip of snout; posterior margins of operculum broadly convex, figure 8a; tips of pectorals not quite reaching to pelvic insertions; cheek as long as eye and half snout; scales about 38 to 42; anal rays iii, 24 to iii, 29.

Anchoa trinitatis (Fowler)

5b. Origin of dorsal fin notably closer to tip of snout than to midbase of caudal fin; posterior margin of operculum truncate or slightly concave, figures 5, 8, b; tips of pectorals reaching well past pelvic insertions; cheek much longer, equal to eye and twice snout; scales about 45 to 48.

6a. Anal rays iii, 29; caudal fin with posterior margin not blackish; tip of dorsal not blackish. *Anchoa argenteus*, new species.

6b. Anal rays iii, 33 to iii, 38; caudal fin with posterior margin blackish; usually tip of dorsal blackish.

*Anchoa spinifer*² (Cuvier and Valenciennes).

¹ Extracted from Hildebrand's key to *Anchoa*.

² Not yet reported from Venezuela.

ANCHOA GINSBURGI Hildebrand

Anchoa ginsburgi HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 55, fig. 20, 1943 (Gulf of Venezuela).

The following specimens were collected by the U. S. S. *Niagara* in the Gulf of Venezuela in 1925:

Holotype, U.S.N.M. No. 119788, Estanques Bay, February 20.

Paratypes as follows:

U.S.N.M. Nos. 119789, 1 specimen, and 127608, 7 specimens, both lots bearing same data as holotype.

U.S.N.M. No. 127609, 3 specimens, Salinas Bay, April 4-5.

U.S.N.M. No. 127610, 4 specimens, Jacuque Point, January 26.

ANCHOA LYOLEPIS (Evermann and Marsh)

Stolephorus lyolepis EVERMANN AND MARSH, Bull. U. S. Fish Comm., vol. 20, p. 89, fig. 13, 1902 (Culebra, Puerto Rico).

Anchoa lyolepis HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 65, fig. 25, 1943 (Gulf of Venezuela).

The specimen reported by Dr. Hildebrand bears U.S.N.M. No. 127623 and is from Point Macolla, Gulf of Venezuela.

ANCHOA TRICOLOR (Agassiz)

Engraulis tricolor AGASSIZ, in Spix and Agassiz, *Selecta genera et species piscium . . . Brasiliam . . .*, p. 51, pl. 23, fig. 1, 1829 (Bahia, Pará).

Anchoa tricolor HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 74, fig. 30, 1943 (? Gulf of Venezuela).

The specimen from Amuay Bay recorded by Dr. Hildebrand does not seem to be in the national collections. Both of the first gill arches were destroyed, according to his original data, and thus the specimen measuring 63 mm. in total length was referred to *A. tricolor* with much doubt. I have not seen any specimens of this species from Venezuela, and for identification the number of gill rakers must be known.

ANCHOA PARVA (Meek and Hildebrand)

ANCHOA

Anchoa parva MEEK AND HILDEBRAND, *Marine fishes of Panama*, vol. 1, p. 202, 1923 (Porto Bello, Panama).

Anchoa parva HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 83, fig. 35, 1943 (Venezuela).

Anchoa januaria (in part) HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 81, fig. 34, 1943 (Gulf of Venezuela).

U.S.N.M. No. 121772, 18 specimens, 35 to 42 mm. in standard length, Rfo de Los Pajaros, 3 km. above Lago de Maracaibo, April 30, 1942.

U.S.N.M. No. 121768, 7,000 specimens, 11 to 59 mm., Lago de Maracaibo at Yacht Club, Maracaibo, May 16, 1942.

U.S.N.M. No. 121770, a specimen, 21.5 mm., Lago de Maracaibo at Yacht Club, March 5, 1942.

U.S.N.M. No. 121771, a specimen, 24 mm., Lago de Maracaibo, 7 km. south of Maracaibo, March 6, 1942.

U.S.N.M. No. 121774, 37 specimens, 29 to 34 mm., Lago de Maracaibo, 2 miles off Lagunillas, March 15, 1942.

U.S.N.M. No. 121773, 13 specimens, 16 to 33 mm., caño at Los Monitos, Estado de Zulia, Río Limón system, March 11, 1942.

U.S.N.M. No. 121769, 41 specimens, 23 to 44 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

One specimen, 35 mm., Laguna de Tacarigua, Estado de Miranda, F. F. Bond, February 3, 1939.

I have carefully examined the two collections from the Gulf of Venezuela referred by Dr. Hildebrand to *Anchoa januaria*, U.S.N.M. Nos. 127675 and 127676, from Amuay and Salinas Bays, respectively. I found that the gill raker count of U.S.N.M. No. 127675 in one specimen was 18+24 and that the other two specimens had their first arches destroyed, which explains the fact that they were not counted by Dr. Hildebrand, who has been most cooperative in letting me use his original data. One specimen in U.S.N.M. No. 127676 has 17+26 gill rakers, but the others have 12 on the upper arch and numerous small, sharp-pointed teeth in both jaws and a short maxillary with rounded posterior end. I am therefore referring them to *Anchoviella blackburni*. Thus, the range of *A. januaria* must again be restricted to Brazil.

The following counts were made on specimens from Venezuela. Anal rays iii,18 in 4, iii,19 in 9, iii,20 in 6, and iii,21 in 9 specimens; pectoral rays i,11 in 2, i,12 in 4, and i,13 in 4; vertebrae 39 in 1 and 40 in 11 specimens; on 3 specimens the gill rakers were as follows: 18+1+27; 18+1+26; 19+1+26; 17+1+25; 18+1+23; and 18+1+25. The dorsal fin had ii,13 rays in 2 specimens counted.

ANCHOA TRINITATIS (Fowler)

FIGURE 6, a

Anchoa trinitatis FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 67, p. 527, fig. 3, 1915 (Trinidad).

Anchoa trinitatis HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 96, fig. 40, 1943 (coast of Venezuela).

The following specimens were identified tentatively as belonging to this species:

U.S.N.M. No. 121778, 3 specimens, 44.5 to 66 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

U.S.N.M. No. 119812, 3 specimens, 50 to 56 mm., Laguna de Tacarigua, Estado de Miranda, Venezuela, collected by Dr. F. F. Bond, February 3, 1939.

From same collection as U. S. N. M. No. 119812, 15 specimens, 44 to 54 mm.

The following counts were made: Anal rays iii,25 in 3; iii,26 in one; iii,27 in 2; and iii,29 in 2; dorsal rays iii,11 in 3 and iii, 12 in 2; pectoral

rays ii,12-ii-12; ii,13-ii,13; gill rakers $16+1+20$; $17+1+20$; vertebrae 40: 40; scales 40 in one, 41 in 3.

ANCHOA ARGENTEUS, new species

FIGURES 5, 6, b

Holotype.—U.S.N.M. No. 121777, only known specimen, 97 mm. in standard length, collected by Leonard P. Schultz in Lago de Maracaibo 1 km. off Pueblo Viejo in gill net, April 7-9, 1942.

Description.—Certain measurements were made on the holotype, and these data expressed in hundredths of the standard length are recorded in table 4 along with similar data on other species.

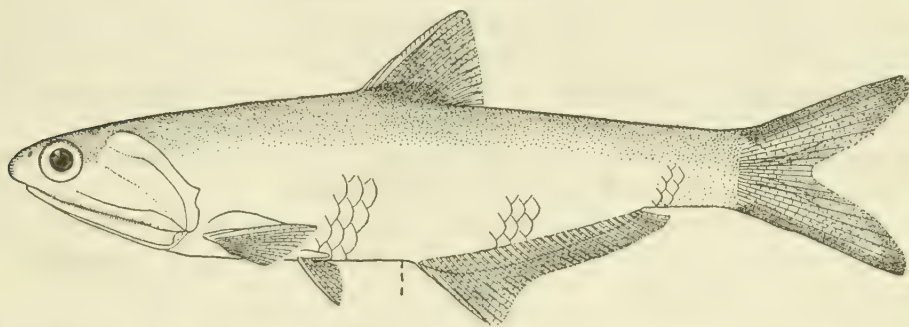


FIGURE 5.—*Anchoa argenteus*, new species: Holotype (U.S.N.M. No. 121777), 97 mm. in standard length. Drawn by Mrs. Aime M. Awl.

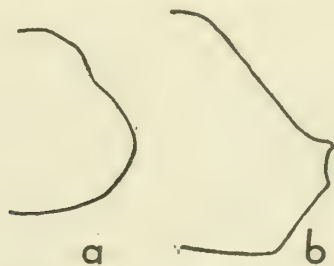


FIGURE 6.—Outline of opercular margin of: a, *Anchoa trinitatis* (Fowler) (U.S.N.M. No. 123222); b, *Anchoa argenteus*, new species (U.S.N.M. No. 121777). Sketches by author.

The following counts were made: Dorsal rays iii, 13; anal iii, 29; pectorals ii,12-ii, 12; pelvics i,6-i,6; scale rows from upper edge of gill opening to midbase of caudal fin 47; gill rakers on first gill arch $15+1+18$.

Body compressed, somewhat elongate, greatest depth about 4.3, head rather long, 3.8, both in standard length; depth of head at joint of mandible slightly greater than postorbital length of head; head longer than greatest depth of body, snout bluntly pointed, projecting much more than half its length beyond tip of mandible, shorter than eye, a little longer than pupil, contained about 6.75 in head; eye $4\frac{1}{2}$

in head; maxillary ending in an elongate triangular point, extending past joint of mandible but not past rear margin of operculum, contained 1.1 in head; mandible bluntly pointed, a trifle curved upward at tip, reaching a little in front of a vertical line at front of nostrils, when mouth is closed; small numerous teeth along margin of both jaws; villiform teeth on vomer, palatines, and pterygoids; cheek 7.2, postorbital length of head 5.75, in standard length; gill rakers rather long, flattened and somewhat broadened at tips, with denticles on their inner edges; depressed length of dorsal fin 1.3 in head, the first branched rays reaching past last ones, when depressed; distal margin of dorsal fin truncate; distal margin of anal somewhat concave; the first anal rays longest; simple ray of pectorals longest; tips of pectoral rays reaching well past the pelvic insertions; pelvics reaching a little more than halfway to anal origin; dorsal fin origin closer to tip of snout than midbase of caudal fin by a little more than length of snout;

TABLE 4.—Measurements made on certain species of *Anchoa* and recorded in hundredths of the standard length

Characters	<i>spinifer</i>		<i>argenteus</i>	<i>trinitatis</i>	
	Gulf of Paria		L. de Maracalbo	Colombia	Venezuela
	131	101	97	71.5	65
Standard length in millimeters.....					
Length of head.....	25.9	26.7	26.6	24.0	26.9
Greatest depth of body.....	26.3	25.5	23.0	25.4	25.7
Length of snout.....	4.04	4.18	4.12	4.90	6.00
Diameter of eye.....	5.95	6.14	6.19	7.40	8.46
Length of mandible (from tip of chin).....	19.2	20.2	20.4	17.1	18.5
Length of maxillaries (from tip of snout).....	24.4	25.8	25.3	22.4	24.9
Greatest width of bony interorbital space.....	5.12	5.74	5.67	5.87	7.38
Postorbital length of head.....	17.4	17.4	17.7	12.9	14.3
Length of cheek.....	12.7	12.9	13.2	8.80	9.84
Longest gill raker.....	3.05	4.85	3.82	3.64	3.38
Length of longest fin ray of:					
Dorsal.....	22.0	19.2	17.3	-----	-----
Anal.....	14.8	14.5	12.9	-----	-----
Pectoral.....	21.4	20.2	14.6	16.6	-----
Pelvics.....	9.77	9.32	8.35	9.08	8.92
Caudal.....	23.7	-----	23.2	-----	-----
Shortest caudal fin ray.....	11.2	11.2	9.80	-----	-----
Length of base of anal.....	37.6	35.7	32.1	34.3	32.0
Length of base of dorsal.....	11.8	12.3	12.8	12.0	10.9
Distance pelvic insertion to anal origin.....	17.5	14.6	15.6	17.5	15.7
Snout tip to dorsal origin.....	44.7	49.7	48.9	55.4	55.7
Snout tip to anal origin.....	56.9	56.4	56.7	58.3	62.0
Snout tip to pectoral insertion.....	26.2	28.2	28.7	25.7	29.2
Snout tip to pelvic insertion.....	42.8	42.6	41.9	43.6	46.2
Length of caudal peduncle.....	12.4	14.1	13.7	13.7	12.6
Least depth of caudal peduncle.....	10.7	11.4	10.9	11.0	10.3
Length of pectoral axillary scale from pectoral insertion to tip of scale.....	9.54	11.9	11.9	9.09	10.0

origin of anal fin under a vertical line through middle of length of dorsal fin base; axillary scale of pectoral extending out about halfway to tip of pectoral fin; upper posterior margin of operculum truncate or nearly so, the lower posterior corner angular with short concave edge, figure 6, *b*, length of base of anal fin 3.2 in standard length.

Coloration.—In alcohol, the back is straw colored with considerable dark pigmentation; these pigment cells extend over middle of front of snout but sparsely; the lower two-thirds of sides of body are silvery; dark pigment cells are numerous basally on dorsal fin becoming fewer distally and wholly lacking on outer third of fin; outer margins of caudal fin darkish, but middle of caudal fin and its distal parts non-pigmented; anal, pectoral, and pelvic fins nonpigmented.

Remarks.—This new species would trace down through Dr. Hildebrand's key to the species of *Anchoa* on pp. 29–30 of his revision of the Engraulidae to his section "C" for *Anchoa spinifer*. However, *A. argenteus* differs from *spinifer* in having fewer anal rays, iii,29 instead of iii,33 to iii,38, and the posterior margin of caudal and tip of dorsal fin are not blackish as in *spinifer*. From the local Venezuelan species of *Anchoa* it may be separated by the key on page 42.

Named *argenteus* in reference to the brilliant silvery lower sides.

Genus ANCHOVIELLA Fowler

Anchoviella FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 63, p. 211, 1911.
(Genotype, *Engraulis perfasciatus* Poey.)

KEY TO THE SPECIES OF ANCHOVIELLA FROM VENEZUELA¹⁰

- 1a. Origin of anal entirely behind base of dorsal fin, generally under or behind tip of last dorsal ray when depressed; gill rakers on first arch 24 to 28 + 27 to 33; eye small, 4.4 to 4.8 in head and 2.5 to 2.75 in postorbital part of head; anterior rays of dorsal reaching past tip of last ray when fin is depressed; gill rakers as long as eye, broad and close set, with minute serration on inner edge.....*Anchoviella estauquae* Hildebrand
- 1b. Anal origin under posterior half of base of dorsal fin; gill rakers on first arch 16 to 18 + 23 to 26; pectoral fin with 12 or 13 rays; maxillary reaching $\frac{3}{4}$ diameter of eye beyond orbit; cheek as long as eye; eye 3.2 to 3.5 in head; axillary scale of pectoral short, extending to or somewhat beyond midlength of that fin 2.4 to 2.9 in head; median dark stripe posterior to anal fin.....*Anchoviella guianensis* (Eigenmann)
- 1c. Origin of anal fin under or in advance of middle of dorsal fin base.
 - 2a. Gill rakers 10 to 12 + 15 to 17; depth 4.8 to 5.5; head 4.0 to 4.6, both in standard length; anal rays iii,22 to iii,26; vertebrae 42 or 43, two specimens dissected.....*Anchoviella blackburni* Hildebrand
 - 2b. Gill rakers 28 to 34 + 36 to 45; depth 3.5 to 3.9 in adults, head 3.5, both in standard length; anal rays iii,21 to iii,23....*Anchoviella pallida* (Starks)

ANCHOVIELLA ESTAUQUAE Hildebrand

Anchoviella estauquae HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 115, fig. 48, 1943 (Estanques, misspelled "Estauques" Bay, Gulf of Venezuela).

¹⁰ Extracted from Hildebrand's key to *Anchoviella*.

U.S.N.M. No. 119795, holotype, Estanques Bay, U. S. S. *Niagara* February 20, 1925.

U.S.N.M. No. 119796, 3 paratypes bearing same data.

ANCHOVIELLA GUIANENSIS (Eigenmann)

Stolephorus guianensis EIGENMANN, Mem. Carnegie Mus., vol. 5, p. 447, pl. 62, fig. 5, 1912 (Bartica Rocks, British Guiana).

Anchoviella guianensis FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 406, 1931 (Caño de Guanoco, Venezuela).—HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 123, fig. 52, 1943 (Venezuela).

ANCHOVIELLA BLACKBURNI Hildebrand

Anchoviella blackburni HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 129, fig. 57, 1943 (Estanques (not "Estauques") Bay and Jacuque Point, Gulf of Venezuela).

U.S.N.M. No. 121775, 1 specimen, 37 mm. in standard length, mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

U.S.N.M. No. 127606, a paratype, Estanques Bay, U. S. S. *Niagara*, February 20, 1925.

U.S.N.M. No. 119794, 9 paratypes, Jacuque Point, U. S. S. *Niagara*, January 26, 1925.

U.S.N.M. No. 121776, 3 specimens, 31.5 to 33.5 mm., Salinas Bay, U. S. S. *Niagara*, April 4, 1925.

67 specimens, 18 to 22 mm., lagoons 15 km. north of Maracaibo, F. F. Bond, April 6, 1938.

The following counts were made: Anal iii, 23 in 2 specimens; pectoral rays ii, 14–ii, 14; gill rakers 12+1+17 in 3 specimens and 12+1+18 and 12+1+16 in 1 each, vertebrae 42 in 1 specimen.

ANCHOVIELLA PALLIDA (Starks)

Anchovia pallida STARKS, The fishes of the Stanford expedition to Brazil, p. 9, pl. 1, 1913 (Pará, Brazil).

Anchoviella venezuelae FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, pp. 406–407, fig. 6, 1931 (Caño de Guanoco, mouth of Río San Juan, Venezuela).

Anchoviella pallida HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 134, fig. 59, 1943 (Caño de Guanoco, Venezuela, to Pará, Brazil).

Genus PTERENGRAULIS Günther

Pterengraulis GÜNTHER, Catalogue of the fishes in the British Museum, vol. 7, p. 398, 1868. (Genotype, *Clupea atherinoides* Linnaeus.)

The genus lacks gill rakers on the posterior side of the first two gill arches, the third may have a few on the upper limb, whereas the fourth arch has a full set of rakers on its posterior side. The anal origin is notably in advance of a vertical line through dorsal origin.

PTERENGRAULIS ATHERINOIDES (Linnaeus)

Clupea atherinoides LINNAEUS, Systema naturae, ed. 12, vol. 1, p. 523, 1766 (Surinam) (ref. copied).

Pterengraulis atherinoides FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 407, 1931 (Caño de Guanoco, Venezuela).—HILDEBRAND, Bull. Bingham

Oceanogr. Coll., vol. 8, art. 2, p 139, fig. 63, 1943 (Caño de Guanoco and Río Apure, San Fernando de Apure, Venezuela).

6 specimens, 18 to 27 and 143 mm., Río Apure at San Fernando de Apure, F. F. Bond, February 16, 1936.

HILDEBRANDICHTHYS, new genus

The characters of the genus are those of the genotype.

Genotype: *Hildebrandichthys setiger*, new species.

HILDEBRANDICHTHYS SETIGER, new species

FIGURE 7

Holotype.—U.S.N.M. No. 121779, only known specimen, 31.5 mm. in standard length, collected near mouth of Caño de Sagua, about 25 km. north of Sinamaica, by Leonard P. Schultz, March 12, 1942.

Description.—The following measurements are expressed in hundredths of the standard length for the holotype: Length of head 32.8; greatest depth of body 22.6; length of snout 6.23; diameter of eye 8.85;

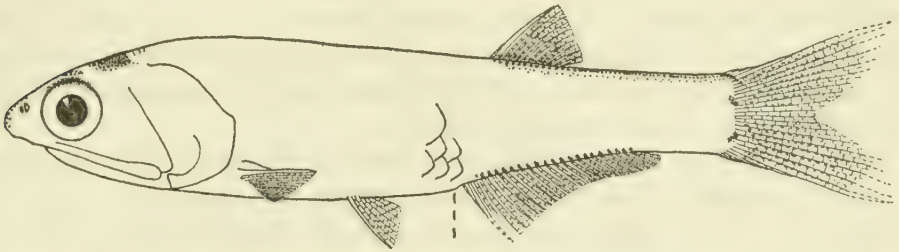


FIGURE 7.—*Hildebrandichthys setiger*, new genus and species: Holotype (U.S.N.M. No. 121779), 31.5 mm. in standard length. Drawn by Mrs. Aime M. Awl.

length of mandible or from tip of lower jaw to rear edge of joint of mandible 18.3; distance from tip of snout to rear of maxillary 23.0; width of interorbital space 6.56; postorbital length of head 18.3; length of cheek 10.5; length of longest gill raker 6.56; longest ray of dorsal fin 10.8; of pectoral fin 11.2; of pelvic fin 8.85; shortest mid-caudal fin ray 11.5; length of anal fin base 23.9; length of dorsal fin base 9.50; distance from pelvic insertion to anal origin 16.4; tip of snout to dorsal origin 70.2; snout to anal origin 65.6; snout to pectoral insertion 35.2; snout to pelvic insertion 49.8; length of caudal peduncle or distance from base of last anal fin ray to midbase of caudal fin 18.0; least depth of caudal peduncle 10.8.

The following counts were made: Dorsal rays ii, 10; anal rays iii, 22; pectoral rays i, 14–i, 15; pelvic rays i, 6–i, 6; and scale rows from upper edge of gill opening to midbase of caudal fin 43.

Head 3.15 and depth 4.5 in standard length; body somewhat compressed, its greatest depth through pectoral fins; depth of head at joint of mandible a little greater than postorbital length of head; snout shorter than eye, nearly 9.2 in head; eye 3.7 in head; maxillary

short, its posterior tip rounded, not quite reaching to joint of mandible; length of maxillaries about 1.7 in head; eye contained nearly 1.2 in the length of cheek; postorbital length of head 5.6 and mandible 5.6 both in standard length; gill rakers rather broad and moderately long in the young holotype; distal margin of dorsal fin truncate, when dorsal fin is depressed the first rays do not quite reach to tips of last rays; origin of dorsal fin behind that of anal fin a distance equal to pupil and equidistant between midbase of caudal fin and $\frac{3}{4}$ of eye behind the head; anal fin base 4.2 in standard length and notably closer to rear of head than midcaudal fin base; pelvic insertion midway between pectoral insertion and anal origin; distal margin of anal fin a little concave; pelvic fins reaching halfway to anal origin and pectoral fins reaching three-fourths the way to pelvic insertion; axillary scale of pectoral reaching not quite halfway to tips of pectorals; caudal fin deeply forked.

Coloration in alcohol.—Some dark pigment cells along midline of back and in two rows along dorsal fin base and thence posteriorly; anal fin base with black pigment cells; top of head brown with a few dark cells on upper surface of snout; caudal fin with dark pigment a little more intense on upper and lower margins and a black speck at midbase of each caudal fin lobe; silvery lateral band not developed in the small type specimen, but operculum is silvery.

Remarks.—The key on page 38 separates *H. setiger* from *P. atherinoides*. See table 5 for counts made on the two species.

Named *setiger* in reference to its numerous gill rakers.

Genus LYCENGRAULIS Günther

Lycengraulis GÜNTHER, Catalogue of the fishes in the British Museum, vol. 7, pp. 385, 399, 1868. (Genotype, *Engraulis grossidens* Cuvier.)

KEY TO THE SPECIES OF LYCENGRAULIS REPORTED FROM VENEZUELA ¹¹

- 1a. Gill rakers 13 to 20+18 to 25 on first arch; origin of dorsal usually about equidistant from midcaudal fin base and posterior margin of eye; pectoral rays 14 to 16; origin of dorsal equidistant between midbase of caudal fin and posterior half of eye or a little behind eye.
- 2a. Vertebrae 43 to 45, usually 43 or 44; anal rays iii, 22 to iii, 28; greatest depth 3.85 to 4.4 (in adults) in standard length; maxillary sharply pointed posteriorly, reaching well beyond joint of mandible, sometimes nearly to margin of opercle, usually 4.8 to 5.3 in standard length.

Lycengraulis grossidens (Cuvier)

- 2b. Vertebrae 41 or 42, rarely 42; anal rays usually iii, 20 to iii, 24; depth 4.3 to 4.9; maxillary not sharply pointed, more rounded at tip, reaching to or a little past joint of mandible, about $5\frac{1}{4}$ to $5\frac{3}{4}$ in standard length.

Lycengraulis limnichthys, new species

- 1b. Gill rakers 9 to 13+12 to 15 on first arch; cheek long and narrow, notably longer than snout and eye, 2.0 to 2.25 in head; body quite slender, the depth 5.25 to 6.0 in length; maxillary reaching nearly or quite to joint of mandible, 5.5 to 5.8 in length; origin of dorsal notably nearer base of caudal than eye; vertebrae 47; anal rays iii, 23 to iii, 25; pectoral rays 13 or 14.

Lycengraulis batesii (Günther)

¹¹ Modified after Hildebrand.

TABLE 5.—Counts recorded for *Pterengraulis*¹ and *Hildebrandichthys*

Species	Number of anal fin rays												Number of gill rakers on first gill arch							
	iii, 22	iii, 23	iii, 24	iii, 25	iii, 26	iii, 27	iii, 28	iii, 29	iii, 30	iii, 31	iii, 32	10 + 13	10 + 14	10 + 15	11 + 13	11 + 14	12 + 14	12 + 15	13 + 16	22 + 15
<i>P. atherinoides</i>					2		9	6	2	1	1	3	7	1	1	5	2	2	1	—
<i>H. setiger</i>	1																			1

¹ The counts for all but four specimens of *P. atherinoides* were kindly furnished me by Dr. Samuel F. Hildebrand from his original notes accumulated during his studies of the American Engraulidae. I take this opportunity to express my gratitude to him for this and other help furnished.

TABLE 6.—Counts made on species of *Lycengraulis* from Venezuela

Species	Anal rays								Vertebrae					Dorsal rays		Pectoral rays		
	iii, 20	iii, 21	iii, 22	iii, 23	iii, 24	iii, 25	iii, 26		41	42	43	44	45	iii, 12	iii, 13	i, 13	i, 14	i, 15
<i>grossidens</i>				1	3	4	1			1	7	3	1	1	6	2	10	14
<i>limnichthys</i>	1	4	10	14	4	1		14	1					4	2	3	16	2

LYCENGRAULIS BATESII (Günther)

Engraulis batesii GÜNTHER, Catalogue of the fishes in the British Museum, vol. 7, p. 399, 1868 (Río Pará).—HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 148, fig. 67, 1943 (Rio Apure at San Fernando de Apure, Venezuela).

U.S.N.M. No. 119814, 2 specimens, 42.5 and 62.5 mm. in standard length, from Río Apure, San Fernando de Apure, F. F. Bond, February 16, 1938.

From same collection as U.S.N.M. No. 119814, 8 specimens, 20 to 70 mm.

LYCENGRAULIS LIMNICHTHYS, new species

FIGURE 8

Holotype.—U.S.N.M. No. 121751, 92 mm. in standard length, collected by Leonard P. Schultz on May 1, 1944 in the Río Agua Caliente, 2 to 3 km. above Lago de Maracaibo, Venezuela.

Paratypes.—All paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121752, 59 specimens, 40 to 128 mm. in standard length, collected along with the holotype and bearing same data.

U.S.N.M. No. 121756, 1 specimen, 117 mm., taken in gill net, in Lago de Maracaibo, 1 km. off Pueblo Viejo, April 7–9.

U.S.N.M. No. 121758, 6 specimens, 88 to 118 mm., from Lago de Maracaibo at Yacht Club, Maracaibo, May 16.

U.S.N.M. No. 121753, 40 specimens, 24 to 121 mm., from Lago de Maracaibo near mouth of Río Concha, May 2.

U.S.N.M. No. 121757, 84 specimens, 20 to 80 mm., from the Río de Los Pájaros, 3 km. above Lago de Maracaibo, April 30.

U.S.N.M. No. 121755, 1 specimen, 24 mm., from a pool in drying-up Río San Ignacio about 20 km. south of Rosario, February 26.

U.S.N.M. No. 121754, 2 specimens, 32 and 34.5 mm., off dock at Lagunillas in Lago de Maracaibo, April 14.

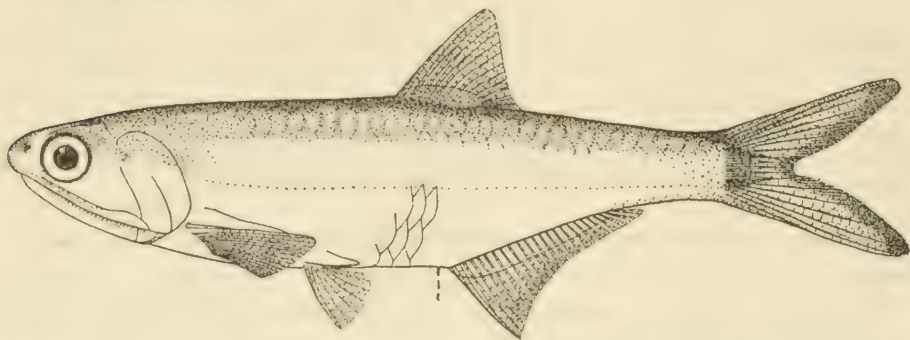


FIGURE 8.—*Lycengraulis limnichthys*, new species: Holotype (U.S.N.M. No. 121751), 92 mm. in standard length. Drawn by Mrs. Aime M. Awl.

Description.—Certain measurements were made, and these data, recorded below, are expressed in hundredths of the standard length, first for the holotype, then for two paratypes in parentheses, respectively. Standard lengths in millimeters 94.0 (48.1; 118.5).

Length of head 27.7 (25.6; 25.2); greatest depth of body 23.6 (20.8; 22.1); length of snout 4.78 (4.16; 4.47); diameter of eye 6.70 (7.69; 6.07); distance from tip of lower jaw to rear of joint of mandible 18.2 (16.6; 18.0); distance from snout tip to rear of maxillary 21.6 (19.7; 21.1); greatest width of interorbital 5.64 (6.03; 5.06); postorbital length of head 16.0 (14.3; 15.3); length of cheek 10.1 (8.11; 10.5); length of longest gill raker on first gill arch 3.08 (4.36; 2.45); length of longest ray of dorsal fin 16.0 (15.4; 14.1), of anal fin 13.3 (12.9; —), of pectoral fin 19.1 (18.7; 17.3), of pelvic fin 9.56 (10.4; 8.69), and of lower lobe of caudal fin 27.1 (25.8; —); shortest midcaudal fin ray 7.76 (9.59; 7.34); length of base of anal fin 24.5 (24.1; 22.4); length of base of dorsal fin 11.2 (11.2; 13.0); distance from pelvic insertion to anal origin 19.9 (18.3; 20.5); tip of snout to dorsal origin 54.8 (53.2; 54.4); snout to anal origin 62.4 (60.9; 59.9); snout to pectoral insertion 27.4 (27.4; 24.7); and to pelvic insertion 44.2 (42.6; 38.4); length of caudal peduncle 18.8 (18.3; 19.0); least depth of caudal peduncle 10.0 (9.77; 10.1).

The following counts were made, respectively: Dorsal rays iii, 12 (iii, 12; iii, 12); anal rays iii, 22 (iii, 22; iii 22); pectoral rays ii, 14-ii, 15 (ii, 13-ii, 14; ii, 14-ii, 14); pelvic rays always i, 6; scales 42 (42; 43).

Body compressed, rather slender, its greatest depth 4.3 to 4.9; depth of head at joint of mandible about four-fifths of postorbital

length of head; head notably longer than greatest depth of body, nearly 4 times in standard length; snout bluntly rounded, projecting less than half its length beyond tip of mandible, shorter than eye, and contained 5.5 to 6 times in head; eye 3 to 4.2 times in head; maxillary slender, not notably pointed, extending to or a little past joint of mandible, 1.3 to 1.4 in head; mandible pointed, curved slightly upward at tip, reaching a little past a vertical line through front of anterior nostril; teeth in lower jaw variable in size, usually 18 to 24 enlarged, the enlarged ones of upper jaw more numerous; cheek longer than snout and eye, about 2.3 to 2.4 in head in specimens longer than 85 mm.; postorbital length of head 6.5 to 7.2 in standard length; gill rakers slender, usually 16 to 18+20 to 23 on first arch; height of dorsal fin about equal to postorbital length of head, its distal margin a little concave; distal margin of anal a little concave; first branched ray of pectoral fin longest, reaching to or a little past insertion of pelvics; pelvic fins not reaching quite halfway to anal origin; caudal fin deeply forked, the lower lobe a little longer and stronger than upper lobe; origin of dorsal fin usually equidistant between midcaudal fin base and rear margin of pupil; origin of anal fin under bases of fifth to seventh branched rays of dorsal fin or a little behind middle of base of dorsal fin; axillary scale of pectoral about three-fourths length of pectoral fin.

Color.—The color of preserved specimens in alcohol is grayish above with a dark streak along middle of back; margin of caudal fin with a narrow blackish band; interradiat membranes of caudal fin lobes with black pigment, especially intense between the third and fourth from middle on lower lobe and fourth and fifth from middle on upper lobe, the middle rays between almost unpigmented; middle of snout with black pigment; upper edge of maxillaries anteriorly with black pigment; inner side of opercle heavily pigmented; peritoneum silvery; silvery lateral band present and as wide as snout and eye over region of anal fin origin.

Remarks.—This new species is so distinct that it does not resemble any form known at present. It is as slender as *L. olidus* but has 41 (rarely 42) vertebrae instead of 46 to 48. *L. grossidens* has 43 or 44 (rarely 45) vertebrae and a much greater depth of body than *L. limnichthys*. In Hildebrand's review of the American anchovies (1943, pp. 141–142), it would trace down to a new section in his key, *ddd* on p. 141. It may be distinguished from other Venezuelan anchovies by the key on page 50.

The smallest female observed with fully mature eggs, apparently ready for deposition, was 75 mm. in standard length and came from the Río Agua Caliente.

Named *limnichthys* in reference to its occurrence in a lake.

LYCENGRAULIS GROSSIDENS (Cuvier)

Engraulis grossidens CUVIER, in Spix and Agassiz, Selecta genera et species piscium . . . Brasiliam . . ., p. 50, pl. C, 1829 (Rio de Janeiro).

Engraulis janeiro SPIX, in Spix and Agassiz, Selecta genera et species piscium . . . Brasiliam . . ., pl. 24, fig. 1, 1829.

Lycengraulis grossidens HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, fig. 64, 1943 (Gulf of Venezuela).

U.S.N.M. No. 121759, 9 specimens, mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

U.S.N.M. No. 127620, 8 specimens, 31 to 142 mm., off south coast of the Gulf, U. S. S. *Niagara*, November 15, 1925.

U.S.N.M. No. 121760, 2 specimens, 26.5 to 52 mm., Point Macolla, U. S. S. *Niagara*, April 19, 1925.

Genus CETENGRAULIS Günther

Cetengraulis GÜNTHER, Catalogue of the fishes in the British Museum, vol. 7, p. 383, 1868. (Genotype, *Engraulis edentulus* Cuvier.)

CETENGRAULIS EDENTULUS (Cuvier)

Engraulis edentulus CUVIER, Le règne animal, vol. 2, p. 323, 1817; ed. 2, vol. 2, p. 323, 1829 (Jamaica) (ref. copied).

Cetengraulis edentulus HILDEBRAND, Bull. Bingham Oceanogr. Coll., vol. 8, art. 2, p. 155, fig. 71, 1943 (Gulf of Venezuela).

U.S.N.M. No. 121780, 165 specimens, 27.5 to 66 mm. in standard length, the mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

U.S.N.M. No. 127677, 2 specimens, 56 and 64.5 mm., Amuay Bay, Gulf of Venezuela, P. P. Blackburn, of the U. S. S. *Niagara*, December 9, 1924.

U.S.N.M. No. 127682, 1 specimen, 72 mm., from south coast, Gulf of Venezuela, P. P. Blackburn, of the U. S. S. *Niagara*, November 15, 1925.

The intestine is greatly coiled in both *edentulus* and *mysticetus* and should prove to be a character of generic significance in this family. The intestine and peritoneum are generally black.

The following counts were made on the Venezuelan specimens: 41 vertebrae in 4 specimens and 42 in 1; anal rays iii,20 in 1, iii,21 in 2, and iii,22 in 6 specimens.

Suborder SALMONIFORMES

Family SALMONIDAE

Genus SALMO Linnaeus

TROUT

Salmo LINNAEUS, Systema naturae, ed. 10, p. 308, 1758. (Genotype, *Salmo salar* Linnaeus.)

SALMO GAIRDNERII Richardson

RAINBOW TROUT; TRUCHA DE ARCO IRIS

Salmo gairdnerii RICHARDSON, Fauna Boreali-Americana, vol. 3, p. 221, 1836 (Columbia River at Fort Vancouver, North America).

U.S.N.M. No. 121693, 1 specimen, 35 mm. in standard length, from the Upper Río Chama above Mucuchíes, Estado de Mérida, March 28, 1942.

The rainbow trout introduced into the mountain streams of Venezuela some years ago appears to have become established there in rather limited numbers.

Suborder INIOMOIDEA

Family SYNODONTIDAE: Lizardfishes

Genus SYNODUS Scopoli

Synodus SCOPOLI, *Introductio historiam naturalem*, p. 449, 1777. (Genotype, *Esox synodus* Linnaeus.) (Ref. copied.)

SYNODUS FOETENS (Linnaeus)

LIZARDFISH; PEZ LAGARTO

Salmo foetens LINNAEUS, *Systema naturae*, ed. 12, p. 513, 1766 (South Carolina).

U.S.N.M. No. 123131, 3 specimens, 240 to 329 mm., [from Estanques Bay, U. S. S. *Niagara*, December 31, 1924.

Order OSTARIOPHYSOIDEA

Suborder CHARACINOIDEA

Family CHARACINIDAE

The characinid fishes were reported upon by me in a previous paper entitled "The Fishes of the Family Characinidae from Venezuela, with Descriptions of Seventeen New Forms," published in the Proceedings of the United States National Museum, volume 95, pp. 235-367, figs. 30-56, September 6, 1944. That study was based on the specimens that I collected in Venezuela during 1942 as well as on other specimens in the United States National Museum collections and on the literature. In that report were recorded from Venezuela 58 genera and 117 species and subspecies, and 29 of these species were from the Maracaibo Basin.

I take this opportunity to correct some of the more important errors that have been observed in my report on this group of fishes.

On page 258 I introduced the new subfamily name Ctenolucinae, but Dr. C. L. Hubbs has called to my attention that in Copeia, 1939, No. 3, p. 168, he had introduced the subfamily name Hepsetinae for a related characinid occurring in Africa. It is by no means certain that the African group is as closely related as the external features seem to indicate, but pending further investigations I shall recognize the subfamily Hepsetinae.

In table 7, p. 263, for *asper* the number of scales above lateral line should be one count each for 7 and 8 instead of 11 under 7 as given.

On page 264, last two lines of large type 7 or 8 should be transposed with 8 or 9.

I overlooked three species described as new by Valenciennes in Cuvier and Valenciennes, *Histoire Naturelle de Poissons*, volume 19, 1846, until it was too late to enter them in my report. The following should be referred to the synonymy of *Hoplias malabaricus* (Bloch): *Macrodon taraira*, p. 508, from Lago de Maracaibo; *Macrodon teres*, p. 521, from Lago de Maracaibo; and *Macrodon guavina*, p. 527, from Laguna de Tacarigua, Valley of the Río Aragua.

Enrico Tortonese (1942, p. 75, pl. 2, fig. 3) reports *Hemibrycon dariensis* Meek and Hildebrand from Río del Paso Real, Puerto Cabello, Venezuela. Since his description and figure agree fairly well with specimens from the Río Tuy and Río Guárico systems, I refer the identification made by Tortonese to *Hemibrycon dentatus metae* Myers, keyed out in my characinid paper on p. 363.

Suborder GYMNOTOIDEA: Peces Cuchillo

Body elongate, usually compressed, cellike; with or without scales; head naked; dorsal fin lacking or represented by a fleshy filament mostly attached along back posteriorly; pelvics absent; anal fin very long; pectoral fins short, rounded; caudal fin absent or very small, the tail tapering to a point in species lacking the caudal fin; mouth with or without teeth; premaxillary and maxillaries forming upper jaws; anus always in front of middle of pectorals, usually under middle of head; shoulder girdle suspended from skull; symplectic bone present; air bladder in two parts connected by a tube; stomach with blind sac and pyloric caeca (after Ellis).

Since publishing my description of *Hypopomus beebei* in *Zoologica*, 1944, and placing it in the family Gymnotidae, I have concluded that it may be advantageous to break this group up into at least three families as recognized in the following key:

KEY TO THE GENERA REPORTED FROM VENEZUELA ¹³

- 1a. Lower jaw not prolonged or longer than upper jaw; a large frontal and parietal fontanel along middorsal line of head; head not depressed; teeth if present villiform or minute; electric organs absent (family Sternarchidae).
- 2a. Caudal fin absent; the tail behind anal fin slender and tapering to a point; dorsal filament absent.
- 3a. Snout not tubular, but short or moderately elongate.
- 4a. Orbital margin free; both jaws with villiform teeth.

Sternopygus Müller and Troschel
- 4b. Orbital margin not free.
- 5a. A cylindrical filament in a pair of grooves on under side of head in mental region; snout short, head chubby; teeth absent.

Steatogenys Boulenger

¹³ See table 7 for anal-ray counts.

TABLE 7.—Anal-ray counts made on species of *Gymnotidae*

Genus and species	142	144	146	148	150	152	154	176	178	180	182	184	186	188	190	192	194	196	198	200	202	204	206	208	210	212	214	216	218	
	143	145	147	149	151	153	155	177	179	181	183	185	187	189	191	193	195	197	199	201	203	205	207	209	211	213	215	217	219	
<i>Apteronotus cuchillo</i> ¹								1	1	3	1	1	2					1												
<i>Apteronotus leptorhynchus</i> ¹	1		2	1	1	1																								
<i>Eigenmannia virens</i> ¹									1	1	1	2	2		1		1		2	1		1								
<i>Eigenmannia goajira</i> ¹																														
<i>Eigenmannia controstris</i> ²																									2	1				
<i>Sternopygus macrurus</i> ³																														
<i>Sternopygus pejeraton</i> ¹																														
Genus and species	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278	280	282	284	286	288	290	292	294	296	298	300	302	304	306	
	251	253	255	257	259	261	263	265	267	269	271	273	275	277	279	281	283	285	287	289	291	293	295	297	299	301	303	305	307	
<i>Apteronotus cuchillo</i> ¹																														
<i>Apteronotus leptorhynchus</i> ¹																														
<i>Eigenmannia virens</i> ¹																														
<i>Eigenmannia goajira</i> ¹																														
<i>Eigenmannia controstris</i> ²																														
<i>Sternopygus macrurus</i> ³	1		1		2	1	1	2			1		1	1	1															
<i>Sternopygus pejeraton</i> ¹																														

¹ Counts made on specimens from the Maracaibo Basin.

² U. S. N. M. No. 52543 from Amazon Basin with 239 rays; other counts from Eigenmann and Allen.

³ Counts made on specimens from the Río Guárico and from the Maracaibo Basin.

5b. Under side of head normal, without a pair of grooves with a filament.

6a. Teeth present in both jaws; body compressed.

Eigenmannia Jordan and Evermann

6b. Teeth absent in jaws; head and body compressed to rounded; the length of head equal to or longer than greatest depth; anterior nasal opening in front of upper lip and posterior nasal opening rather close to front of eye; anal fin origin about under tips of pectoral fins; prominent pores along "lateral line" canals on head; anal papillae well developed-----**Hypopomus** Gill

3b. Snout tubular, produced; jaws without teeth.

Rhamphichthys Müller and Troschel

2b. Tail rather short, caudal fin present sometimes minute; dorsal filament present; orbital margin not free.

7a. Snout much produced (these genera not yet reported from Venezuela).

7b. Snout heavy and blunt, not produced or tubular.

8a. Teeth present in both jaws; gill opening extending a little over halfway down in front of pectoral fin base; posterior nostril a trifle closer to anterior nostril than to eye-----**Apteronotus** Lacepède

8b. Teeth present in lower jaw; upper jaw without teeth; gill opening barely extends halfway to opposite pectoral fin base; posterior nostril closer to eye than to anterior nostril.

Sternarchogiton Eigenmann and Ward

8c. Teeth absent in both jaws; posterior nostril not quite touching the upper front margin of eye, anterior nostril midway between eye and tip of snout-----**Adontosternarchus** Ellis

1b. Lower jaw projecting in front of upper jaw; frontal fontanel absent; head depressed; dorsal filament absent; teeth conical in sockets.

9a. Anal fin not continuous around end of slender tail; body scaled; no electric glands (family Gymnotidae)-----**Gymnotus** Linnaeus

9b. Anal fin continuous around end of tail; body scaleless; electric glands present (family Electrophoridae)-----**Electrophorus** Gill

Family STERNARCHIDAE

Genus STERNOPYGUS Müller and Troschel

Sternopygus MÜLLER AND TROSCHER, *Horae ichthyologicae*, pt. 2, p. 13, 1849.
(Genotype, *Gymnotus macrurus* Bloch and Schneider.)

KEY TO THE SPECIES OF STERNOPYGUS

1a. Anal rays number more than 300; snout very blunt, upper profile distinctly convex (Amazon)-----**Sternopygus obtusirostris** Steindachner

1b. Anal rays fewer than 300 or the upper profile of the head concave or straight.

2a. A black blotch behind head just above gill opening; interorbital space equal to distance from tip of snout to halfway between rear nostril and eye; dorsal profile of head convex or nearly straight; interorbital space into head 3.4 to 4 times and into length of pectoral fin 1.2 to 1.6 times; snout to occiput 7.4 to 8.4 and postorbital length of head 9.3 to 10.5, both into length of anal fin base; midaxis of body with a pale or yellowish streak posteriorly; anal rays 250 to 279 as counted by me on specimens from Venezuela-----**Sternopygus macrurus** (Bloch and Schneider)

2b. No black blotch behind head; interorbital space equal to distance from snout tip to rear nostril; dorsal profile of head concave; interorbital into head 4.7 to 6.0 and into length of pectoral fin 1.6 to 2.2 times; snout to occiput 5.7 to 7.4 and postorbital length of head 7.2 to 9.3, both into length of anal fin base.

3a. Posteriorly along midaxis of body and on tail is a bright lemon yellowish streak, pale in alcohol; tail rounded behind anal base, tapering to a point; postorbital length of head 7.3 to 8.6 into length of anal base; snout to occiput into anal base 5.7 to 6.6; interorbital space 1.6 to 2.0 into longest pectoral fin ray; anal rays 278 to 306.

***Sternopygus pejateron*, new species**

3b. Midaxis of body plain in color and without a pale streak; tail compressed behind anal base; postorbital length of head 8.1 to 9.3 into anal fin base; snout to occiput into anal base 6.3 to 7.3; interorbital into longest pectoral fin ray 1.8 to 2.2; anal rays 256 to 292 (Panama).

***Sternopygus dariensis* Meek and Hildebrand**

STERNOPYGUS MACRURUS (Bloch and Schneider)

Gymnonotus macrurus BLOCH AND SCHNEIDER, *Systema ichthyologiae*, p. 522, 1801 (Brazil).

Sternopygus carapus PETERS, *Monatsb. Akad. Wiss. Berlin*, 1877, p. 473 (San Fernando de Apure, Venezuela)—SACHS, *Aus den Llanos*, 1879, p. 279 (Apure).

Sternopygus macrurus EIGENMANN AND ALLEN, *Fishes of western South America*, p. 313, 1942 (Orinoco).

U.S.N.M. No. 121574, 11 specimens, 94 to 210 mm. in total length, from Río Guárico and tributaries between San Sebastián and San Casimiro, L. P. Schultz, G. Zuloaga, Roger Sherman, and William Phelps, Jr., May 12, 1942.

U.S.N.M. No. 121573, 2 specimens, 250 and 260 mm. in total length, from the Río San Pedro at bridge, south of Mene Grande, March 20, 1942.

U.S.N.M. No. 121577, a specimen, 378 mm., from Río San Juan at bridge, south of Mene Grande, March 20, 1942.

U.S.N.M. No. 121575, a specimen 443 mm., Río Motatán at bridge, 22 km. north of Motatán, March 17, 1942.

U.S.N.M. No. 121576, 6 specimens, 125 to 237 mm. and 1 480 mm. to end of anal (tail regenerating), Río Negro below mouth of Río Yasa, March 2, 1942.

The following measurements were made on a specimen 377 mm. in total length from the Río San Juan, collected March 20; the data are expressed in hundredths of the length to end of anal fin (which is 316 mm.): Length of anal fin base 83.8; head 16.3; snout 5.38; eye 1.04; interorbital 4.05; postorbital length of head 9.97; snout to anus 9.96; snout to anal origin 16.1; anus to anal origin 7.00; longest pectoral ray 6.42; longest anal ray 4.11; snout to occiput 9.97; greatest depth 13.1; depth of head through eyes 6.17; distance from anterior to posterior nostril 2.03; eye to posterior nostril 2.38; width of gill opening 4.68; snout to rictus 2.85; snout to end of maxillary 3.16; snout to pectoral insertion 15.7; length of tail beyond anal 19.9.

Anal rays 277 and pectoral rays iii,11-iii,12.

STERNOPYGUS PEJERATON, new species

PEJE RATÓN

PLATE 1, A

Holotype.—U.S.N.M. No. 121572, 505 mm. in total length, collected by Leonard P. Schultz in the Río Apón, about 35 km. south of Rosario, in the Maracaibo Basin, February 26, 1942.

Paratypes.—The paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela (measurements are for total length):

U.S.N.M. No. 121564, 17 specimens, 121 to 645 mm., taken with the holotype and bearing same data.

U.S.N.M. No. 121570, 14 specimens, 143 to 385 mm., Río Palmar at bridge, 70 km. southwest of Maracaibo, March 6.

U.S.N.M. No. 121568, 3 specimens, 165 to 188 mm., Río Machango, 20 km. above bridge, south of Lagunillas, March 21.

U.S.N.M. No. 121569, 2 specimens, 195 and 228 mm., Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

U.S.N.M. No. 121565, 14 specimens, 117 to 442 mm. Río Motatán at bridge 22 km. north of Motatán, March 17.

U.S.N.M. No. 121566, 7 specimens, 131 to 615 mm., Río Negro below mouth of Río Yasa, March 2.

U.S.N.M. No. 121567, 17 specimens, 163 to 430 mm., Río Socuy, 3 km. above mouth, February 24.

U.S.N.M. No. 121571, 2 specimens, 635 and 710 mm., Río Machango at bridge south of Lagunillas, March 16.

Description.—Based on the holotype and paratypes. Measurements, expressed in hundredths of the distance from snout to rear end of anal fin, first for the holotype, then for a paratype, in parentheses, are recorded below, respectively. Total length in mm. 505 (187).

Distance from tip of snout to rear end of anal fin in mm. 455 (160). Length of anal fin base 81.7 (86.3); length of head 16.5 (16.9); snout 5.28 (5.75); eye 0.92 (1.06); interorbital space 2.75 (3.81); postorbital length of head 10.0 (10.6); distance from snout to anus 10.3 (11.9); snout to anal origin 16.8 (18.1); snout to occiput 12.9 (13.5); snout to pectoral insertion 16.1 (16.9); length of longest pectoral ray 6.26 (6.88); longest anal ray 5.72 (6.56); greatest depth of body 13.1 (12.8); depth of head through eyes 5.82 (5.94); distance from anterior nostril to posterior nostril 1.87 (1.88); eye to posterior nostril 2.53 (2.56); width of gill opening 4.28 (5.38); tip of snout to rictus 3.41 (3.12); tip of snout to rear of maxillary 3.96 (3.44); length of tail beyond end of anal fin 11.2 (16.4).

The following counts were made, respectively: Anal rays 298 (282); pectoral rays iii,13-iii,14 (iii,13-iii,13). There appear to be about 20 to 25 scales between the lateral line and midline of the back.

Body compressed, tail rounded beyond end of anal fin; snout elongate; rear margin of eye in front of middle of length of head, a distance equal to the space between eye and posterior nostril; dorsal profile of head usually a little concave, sometimes nearly straight in the young; pectoral fin equal to distance from rear of eye to snout tip; margin of eye free; gill opening extending some distance above and below pectoral fin base; anal origin under rear of base of pectoral fin; anus under middle of length of head; lateral line straight, complete; scales on upper sides of body and on tail a little enlarged; interorbital space convex equal to distance from tip of snout to rear nostril; length of head much longer than greatest depth; head about $5\frac{1}{2}$ to 6 times in distance to end of anal fin; tail extends beyond anal fin a distance about equal to or a little greater than length of head.

Color.—Body uniformly dark brownish everywhere; middle of sides posteriorly with a narrow pale streak, lemon yellowish in living fish; operculum with slight intensification of the pigment; all anal and all pectoral rays darkish, the interradi al membranes pale.

Remarks.—This new species is most closely related to *Sternopygus dariensis* Meek and Hildebrand from Panama. It may be distinguished from it by having the pale streak along midaxis of body and tail posteriorly and by the key on page 59. From *S. macrurus* the new species differs in having the head with a concave dorsal profile, and in addition, the interorbital space is more convex and narrower in *S. pejeron*.

Named *pejeron*, after the common name of this fish, peje ratón, as given to me many times in the Maracaibo Basin, in reference, no doubt, to its ratlike tail.

Genus STEATOGENYS Boulenger

Steatogenys BOULENGER, Trans. Zool. Soc. London, vol. 14, No. 7, p. 428, 1898.
(Genotype, *Rhamphichthys (Brachyrhamphichthys) elegans* Steindachner.)

STEATOGENYS ELEGANS (Steindachner)

Rhamphichthys (Brachyrhamphichthys) elegans STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 42, p. 89, 1880 (mouth of Río Negro).
Tateichthys duidae LA MONTE, Amer. Mus. Nov. No. 373, p. 1, fig. 1, 1929 (Burned Mountain Creek, Mount Duida, Venezuela).

Genus EIGENMANNIA Jordan and Evermann

Eigenmannia JORDAN AND EVERMANN, U. S. Nat. Mus. Bull. 47, p. 341, 1896.
(Genotype, *Sternopygus humboldtii* Steindachner [substitute name for *Cryptops* Eigenmann].)

KEY TO THE SPECIES OF EIGENMANNIA REPORTED FROM VENEZUELA

1a. Anal rays 185 to 224; rear margin of eye an eye diameter in front of middle of length of head; dorsal profile of head convex; snout shorter than interor-

bital space; a narrow black streak along lateral line; black pigment on each bony support along base of anal fin.

***Eigenmannia virescens* (Valenciennes)**

- 1b. Anal rays 255 and 263; rear margin of eye at middle of length of head; dorsal profile straight or a trifle concave; snout much longer than interorbital space; no black streak along lateral line; no black pigment along base of anal fin.-----***Eigenmannia goajira*, new species**

EIGENMANNIA VIRESCENS (Valenciennes)

Sternarchus virescens VALENCIENNES, in d'Orbigny, Voyage dans l'Amérique Méridionale, Poissons, vol. 2, pl. 13, fig. 2, 1847 (ref. copied).—EIGENMANN AND WARD, Proc. Washington Acad. Sci., vol. 7, p. 172, fig. 14, 1905 (Río Magdalena to Río de La Plata, east of Andes).—HILDEBRAND, Field Mus. Nat. Hist., zool. ser., vol. 22, No. 4, p. 292, 1938 (Río Mamoni near Chepo, Río Tuyra to Río Magdalena to Buenos Aires).

Eigenmannia virescens humboldtii IHERING, Rev. Mus. Paulista, vol. 7, p. 283, 1907 (Venezuela, Amazona, Marajó).

Sternopygus virescens SACHS, Aus den Llanos, 1879, p. 279 (Apure).—EIGENMANN AND EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 16, 1891 (Orinoco).

U.S.N.M. No. 121581, 8 specimens, 120 to 165 mm., Río Apón, about 35 km. south of Rosario, February 26, 1942.

U.S.N.M. No. 121579, 4 examples, 88 to 128 mm., Río San Pedro at bridge, south of Mene Grande, March 20, 1942.

U.S.N.M. No. 121578, 11 specimens, 80 to 136 mm., Río Negro below mouth of Río Yasa, March 2, 1942.

U.S.N.M. No. 121583, 10 specimens, 73 to 165 mm. Río Socuy, 3 km. above mouth, February 24, 1942.

U.S.N.M. No. 121582, 4 specimens, 97 to 160 mm., Río San Juan near the bridge south of Mene Grande, March 17 to 20, 1942.

U.S.N.M. No. 121580, 10 specimens, 145 to 210 mm., Río Motatán at bridge, 22 km. north of Motatán, March 17, 1942.

The following number of anal rays were counted on the specimens listed above: 179; 180; 182; 184; 185; 187; 187; 190; 194; 198; 199; 201 and 205.

This species, when taken from the water, was silvery in coloration and more or less translucent.

As a result of my examination of various specimens of *Eigenmannia* centering around the species currently recognized as *virescens*, I am forced to conclude that this species should be broken up into one or more subspecies. One should especially note that in British Guiana two species are undoubtedly passing under *E. virescens*. Specimens from the Botanic Garden (U.S.N.M. No. 66296) and others have 185 to 198 anal rays. Those from Wismar (U.S.N.M. No. 66298) have 208 to 224 anal rays and the anal fin has a dark band distally more intense anteriorly on these alcoholic specimens. I have not yet been able to work out the valid names for these two species. Undoubtedly the Panamanian form of *virescens* should be described as a new subspecies on the basis of fewer anal rays (165), a larger eye, and longer pectoral fin, but I hesitate to take this step as our only specimen is without a tail.

EIGENMANNIA GOAJIRA, new species

PLATE 1, B

Holotype.—U.S.N.M. No. 121596, 500 mm. in total length and 385 mm. from snout tip to end of anal fin base, collected by Leonard P. Schultz, February 24, 1942, in the Río Socuy, 3 km. above its mouth.

Paratype.—U.S.N.M. No. 121597, 430 mm. total length (with regenerated tail), and 347 mm. from snout tip to end of anal fin base, taken along with the holotype and bearing same data.

The types were collected over a sandy to muddy bottom.

Description.—Measurements were made on the holotype and paratype, and these data, expressed in hundredths of the distance from tip of snout to rear end of anal-fin base, are recorded in table 8.

The following counts were made, respectively, for holotype and paratype: Anal rays 263 and 255; pectoral rays ii, 18–ii, 19 and ii, 16–ii, 17.

TABLE 8.—Measurements, expressed in hundredths of the distance from snout to end of anal-fin base, for species of *Eigenmannia*

Characters	<i>goajira</i>		<i>conirostris</i> ¹	<i>virescens</i>
	Holotype	Paratype		
Total length in millimeters.....	500.0	430.0	405.0	207.0
Snout to end of anal fin in millimeters.....	385.0	347.0	275.0	152.0
Length of anal base.....	87.8	85.6	85.5	88.2
Length of head.....	12.0	13.5	12.9	14.1
Snout.....	4.08	5.18	3.64	4.28
Eye.....	1.56	1.53	2.63	2.00
Interorbital.....	2.47	3.05	2.07	4.74
Postorbital length of head.....	6.80	7.06	7.64	8.76
Distance between anterior and posterior nostrils.....	1.04	1.38	1.09	1.71
Distance between eye and posterior nostril.....	2.05	2.25	1.27	1.58
Width of gill opening.....	3.12	3.75	4.18	4.60
Tip of snout to rictus.....	1.69	2.02	3.09	2.70
Snout to anus.....	6.88	7.06	10.2	7.57
Snout to anal origin.....	14.0	14.8	14.2	15.8
Anus to anal origin.....	7.14	7.87	4.18	8.95
Snout to occiput.....	10.3	11.0	9.24	10.9
Snout to pectoral insertion.....	12.0	13.2	12.7	13.6
Longest pectoral ray.....	6.94	7.38	7.10	-----
Longest anal ray.....	5.02	5.19	5.10	6.12
Greatest depth of body.....	12.1	13.3	13.0	17.4
Depth of head through eyes.....	5.46	5.90	5.82	8.23
Length of tail beyond anal fin.....	29.6	² 22.2	48.4	36.9

¹ This specimen, U.S.N.M. No. 52543, was reported upon by Eigenmann and Bean (Proc. U. S. Nat. Mus., vol. 31, p. 666, 1907) as *Eigenmannia troscheli*, but I now identify it as *E. conirostris* Eigenmann and Allen.

² Regenerated tail.

The body is elongate, compressed, but the tail is rounded, and the length of the tail behind anal fin is contained 2.9 times in length of

anal-fin base; the dorsal profile of the head is straight or with a very slight concavity; the snout is somewhat pointed and rounded; the rear margin of the eye is at about the midlength of the head or a little in front of it; the eye is contained $2\frac{2}{3}$ to $3\frac{1}{3}$ in the snout and 1.5 to 1.8 in the interorbital space; the anus is under rear of eye; origin of anal fin under rear of base of pectoral fin; the gill opening extends above and below base of pectoral fin; upper and lower jaws with patches of villiform teeth; the lower jaw is a little shorter than upper, so that the snout projects a little; the mouth is small, so that the rictus or corner of mouth is just a trifle behind a vertical line through anterior nostril; tip of snout to rear of maxillary 2 in snout; distance between anterior and posterior nostrils 1.5 times in distance from eye to posterior nostril; the interorbital space is convex, and its width is equal to the distance from the tip of snout to posterior nostril; the lateral line is straight; body and tail covered with scales, head naked; the scales along sides of body largest; about 13 or 14 rows of scales between lateral line and middorsal line; the pectoral fin length is equal to the distance from center of eye to rear of head; fontanel present along middorsal line of head. Apparently both specimens are males with short anal papillae and the testes are fully developed.

Color.—Live examples of this species were silvery on sides and a little darker dorsally. In alcohol it is plain pale in color on sides and pale brownish dorsally; a dark brown streak continues on dorsal surface of tail to its tip, contrasting sharply with the whitish sides and whitish ventrally; pectoral and anal fins white; operculum with a dark blotch; peritoneum pale.

Remarks.—This new species of gymnotid eel would trace down through the "Key to the Species of Genus *Eigenmannia*" by Eigenmann and Allen (1942, p. 315) to their new species *E. conirostris* on the basis of 239 to 259 anal rays; all other species of *Eigenmannia*, such as *virescens*, *trocheli*, and *macrops*, have fewer than 225 anal rays. In addition, *macrops* has the caudal filament equal to "half the total length without the head," while in *goajira* the caudal filament is contained nearly 3 times in the anal-fin base; *virescens* has a black streak along lateral line, another along base of anal fin, both lacking in *goajira*; *trocheli* has a very bluntly rounded short snout contained about 3.75 to 4 in the head instead of 2.6 to 3 in the head of *goajira*. *E. conirostris* and the new species are closely related but differ in the position of the eye; in *conirostris* the rear margin of the eye is about an eye diameter closer to tip of snout than rear of head instead of equal distance as in *goajira*; in addition, *goajira* appears to have a larger number of anal rays, 255 and 263, than *conirostris* with 239 to 259.

Named *goajira* in reference to the district inhabited by the Goajira Indians, where this fish was collected.

Genus HYPOPOMUS Gill

Hypopomus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 152. (Genotype, *Rhamphichthys mulleri* Kaup.)

After examining the material in the national collections, along with four specimens collected by Dr. William Beebe at Caripito, Venezuela, and comparing these with figures and descriptions of the already described species, I have considerable doubt as to the identifications made by Ellis in his review of the family Gymnotidae and by Eigenmann in his work on British Guiana fishes. (The two accounts are nearly identical.) The specimens from Caripito have a very bluntly rounded snout and shorter head, and the pore above the posterior nostril differs in position when compared with forms from other localities. Unfortunately, Kaup did not show the position of that pore in reference to the posterior nostril, but his measurements of and his figure of *artedi* indicate that this species has a pointed snout with the rear margin of the eye behind the middle of the length from snout to occiput, while in other forms it is equidistant between, as shown in figures and in the specimens before me. Steindachner's figure of *brevirostris* fortunately shows the position of the pores in reference to the posterior nostril, and these are the same as in the specimens that I am referring to *occidentalis* Regan from Panama and the Maracaibo Basin, but the species must be different since *brevirostris* has 259 or 260 anal rays instead of fewer than 240 in the other species. Because of the above differences it appears probable that the specimens from Caripito represent a distinct species, whereas those from the Maracaibo Basin are so close to those from Panama that I identify them as the same form. Measurements made on available specimens are recorded in table 9.

KEY TO THE SPECIES OF HYPOPOMUS

- 1a. Anal rays about 259 or 260; pore above posterior nostril (see fig. 9) lying behind a vertical line through rear edge of posterior nostril and this pore more remote from nostril than nostril is from edge of eye; tail behind anal fin rounded, tapering to a point, and length of tail contained about 4 times in total length; distance from posterior nostril to eye contained about 10 to 15 times in snout to occiput (Río Guaporé).

Hypopomus brevirostris (Steindachner)

- 1b. Anal rays fewer than 240, usually from 204 to 238.

- 2a. Rear margin of eye at least one-half to an eye diameter behind middle of length of distance from snout to occiput; snout contained 2.5 to 3 times in the head and about $1\frac{1}{3}$ in postorbital length of head; distance from posterior nostril to eye contained about 15 times in length from snout to occiput; pore above posterior nostril lying behind a vertical line through rear edge of nostril (Río Mona, French Guiana).

Hypopomus artedi (Kaup)¹³

¹³ *Rhamphichthys mulleri* Kaup is referred to this species as a synonym. I have examined a specimen of *artedi*, I. U. 12620, kindly lent by Dr. J. L. Kask, California Academy of Sciences, and refer it to this species.

- 2b. Rear margin of eye midway between tip of snout and occiput; snout contained more than 2 times in postorbital length of head.
- 3a. Distance from posterior nostril to eye contained 9 to 14 times in length from snout to occiput; pore above posterior nostril lying behind a vertical line through rear of nostril, or this line bisecting the pore, the latter separated from nasal opening by an isthmus of skin; tail behind anal compressed and ending rather abruptly not gradually tapering to a rounded point and contained about 5 to 6 times in total length; snout 2.2 to $2\frac{1}{2}$ into postorbital length of head (Río Condoto; Panama; Maracaibo Basin)-----**Hypopomus occidentalis** Regan
- 3b. Distance from posterior nostril to eye contained about 25 to 32 times in distance from snout to occiput; pore above posterior nostril lying close to margin of that nostril and bisected by a line through middle of posterior nostril or the pore is just in front of this line; snout very bluntly rounded, 2.5 to 2.8 times in postorbital length of head; tail very little compressed, tapering to a point and contained about $5\frac{1}{2}$ to 6 times in total length (Caripito, Venezuela)-----**Hypopomus beebei** Schultz

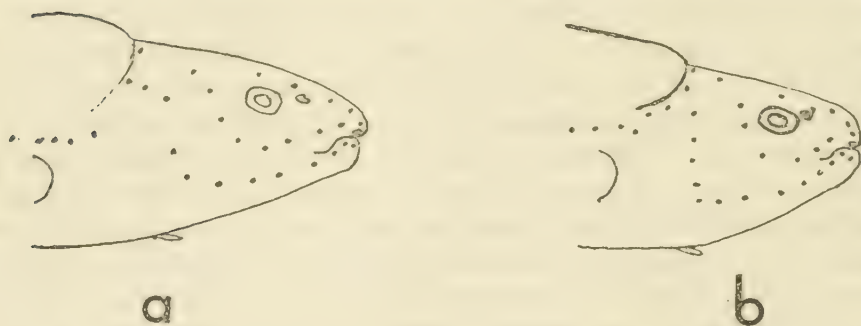


FIGURE 9.—Arrangement of cephalic pores and position of eye: *a*, *Hypopomus occidentalis* Regan; *b*, *Hypopomus beebei* Schultz. Sketches by author.

HYPOPOMUS OCCIDENTALIS Regan

FIGURE 9, *a*

Hypopomus occidentalis REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 14, p. 32, 1914 (Río Condoto, Colombia).

? *Hypopomus brevirostris* IHERING, Rev. Mus. Paulista, vol. 7, p. 281, 1907 (Venezuela).

U.S.N.M. No. 121586, 38 specimens, 63 to 167 mm., Río San Pedro at bridge, Motatán system, March 20, 1942.

U.S.N.M. No. 121584, 8 specimens, 49 to 115 mm., Río San Juan, 12 km. south of Rosario, February 26, 1942.

U.S.N.M. No. 121585, 11 specimens, 70 to 175 mm., Río San Juan at bridge south of Mene Grande, tributary of Río Motatán, March 20, 1942.

HYPOPOMUS BEEBEI Schultz

PLATE 2; FIGURE 9, *b*

Hypopomus beebei SCHULTZ, Zoologica, vol. 29, No. 1, p. 40, fig. 1, pl. 1, fig. 4, 1944 (Caripito, Venezuela).

I wish to point out an error in the figure of this species as published (Schultz, 1944g, pl. 1, fig. 4). On the head occurs a small black spot that might be mistaken for the eye but that does not occur on the fish or on the original photograph but mysteriously appeared when printed. The text figure fortunately shows the eye in its proper position as does the plate mentioned above. In the latter the eye is the whitish area near the front of the snout.

The following description is of the holotype, U.S.N.M. No. 102753, and three paratypes in the collection of the New York Zoological Society. Measurements, along with those for other species, are presented in table 9.

Body compressed, tail slightly compressed and tapering to a point; head bluntly rounded; snout short, about equal to interorbital space, contained about 4.2 times in head; jaws without teeth; length of pectoral fin 2 in head; lateral line straight, the 3 rows of scales below and about 4 rows above enlarged; scales along back and ventrally on body much smaller in size; head a trifle longer than greatest depth; origin of anal fin about opposite tips of pectorals; anal papilla present, its base under middle of opercle or a vertical line through occiput passes through base of anal papilla; lower jaw very slightly shorter than upper; mouth terminal, small; cephalic canals and pores prominent; mucus pores numerous on head; gill opening extending a little above

TABLE 9.—Counts and measurements made on species of *Hypopomus*, expressed in hundredths of the length from snout tip to end of anal fin

Characters	<i>beebei</i>			<i>occidentalis</i>		<i>artedi</i>	<i>brevirostris</i>
	Holo-type	Para-type	Para-type	Maracaibo Basin		After Kaup	After Steindachner's figure
Length to end of anal fin in millimeters.....	112.0	106.0	124.0	100.0	137.0	244.0	252.0
Length of anal fin base.....	83.0	84.0	83.9	85.0	81.7	-----	86.5
Length of head.....	12.1	12.3	11.7	13.1	12.4	13.5	11.7
Length of snout.....	3.21	3.11	3.06	4.0	3.87	5.12	2.78
Greatest depth.....	11.06	11.8	9.68	12.0	13.1	9.30	9.33
Width of interorbital space.....	3.03	3.30	3.14	3.00	2.72	-----	-----
Postorbital length of head.....	8.48	8.20	8.14	8.30	8.03	7.78	7.34
Snout to occiput.....	8.57	8.49	8.06	10.0	9.20	9.02	7.74
Diameter of eye.....	1.25	1.42	1.29	1.50	1.24	0.98	1.59
Distance from anterior to posterior nostril.....	2.23	2.08	2.26	2.70	2.12	-----	1.90
Distance from eye to posterior nostril.....	0.28	0.27	0.32	0.80	0.88	-----	0.56
Width of gill opening.....	2.41	2.73	2.58	2.70	3.22	-----	2.85
Snout to anus.....	8.48	9.34	8.14	9.50	8.61	7.10	8.92
Snout to anal origin.....	17.4	16.6	16.1	16.2	16.8	20.7	15.5
Anus to anal origin.....	9.64	7.83	8.39	7.50	8.39	-----	7.54
Snout to pectoral insertion.....	11.2	11.3	11.3	12.5	12.1	-----	11.7
Longest ray of pectoral fin.....	5.35	5.47	-----	6.20	5.84	5.29	5.36
Longest ray of anal fin.....	4.02	-----	-----	5.00	4.60	-----	3.77
Length of tail beyond anal fin.....	21.0	22.3	20.1	20.5	25.1	20.9	32.9
Width of head at eyes.....	4.46	5.19	4.92	4.30	3.87	-----	-----
Number of anal rays.....	214	228	217	204	223	220 or 223	259 or 260

and below pectoral fin base and more or less enclosing it, except posteriorly; margin of eye not free, eye small, a little over two times in the interorbital space; interorbital space convex, about 3 times in distance from snout tip to occiput; fontanel present from between eyes to occiput.

Color.—Body light brownish in alcohol with 17 narrow dark-brown bars across sides to end of anal fin, sometimes an incomplete or broken bar between most of or all the nearly complete bars; pectoral fins and anal fin with numerous dark brown pigment specks; tail beyond anal fin with about 3 more brown bars more or less obscure or absent.

Genus RHAMPHICHTHYS Müller and Troschel

Rhamphichthys MÜLLER AND TROSCHER, Horae ichthyologicae, pt. 2, p. 15, 1849.
(Genotype, *Gymnotus rostratus* Linnaeus.)

RHAMPHICHTHYS ROSTRATUS (Linnaeus)

Gymnotus rostratus LINNAEUS, Systema naturae, ed. 12, vol. 1, p. 428, 1766.

Rhamphichthys schomburgki STEINDACHNER, Sitzb. Akad. Wiss. Wien, vol. 58, p. 10, 1868 (Río Negro).

Rhamphichthys pantherinus PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 473 (San Fernando de Apure, Venezuela).—SACHS, Aus den Llanos, 1879, p. 279 (Apure).

Rhamphichthys marmoratus EIGENMANN AND EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 62, 1891 (Orinoco).—EIGENMANN AND WARD, Proc. Washington Acad. Sci., vol. 7, p. 168, fig. 12, 1905 (Orinoco and Guianas south to Río de la Plata).

Rhamphichthys rostratus marmoratus IHERING, Rev. Mus. Paulista, vol. 7, p. 280, 1907 (Venezuela).

Genus APTERONOTUS Lacepède

Apteronotus LACEPÈDE, Histoire naturelle des poissons, vol. 2, p. 208, 1800.
(Genotype, *Apteronotus passau* Lacepède=*Gymnotus albifrons* Linnaeus.)

Sternarchus BLOCH AND SCHNEIDER, Systema ichthyologicae, p. 497, 1801. (Genotype, *Gymnotus albifrons* Linnaeus.)

KEY TO THE SPECIES REPORTED FROM VENEZUELA

- 1a. Dorsal profile of head rounded or convex, the snout blunt; interorbital space 3.25 to 3.5 in the head; rear margin of eye at middle of head length; snout about two-thirds length of pectoral fin and about 3 times in greatest depth; depth of head at occiput $1\frac{1}{3}$ in its length; a white band from tip of snout along middorsal line to top of head; two white bands encircle body, the first at rear of anal fin and the second smaller at origin of caudal fin; anal rays 155 to 170.....*Apteronotus albifrons* (Linnaeus)
- 1b. Dorsal profile of head concave or straight in young, snout elongate, not blunt; interorbital space 6 to 9 times in the head and 2 to 2.5 in the snout.
- 2a. Anal fin hyaline or pale; snout elongate, equal to pectoral fin and about 2 times in greatest depth; depth of head at occiput 1.8 to 2 in its length; rear of eye about at middle of length of head; a white band from snout tip along middorsal line to and including dorsal filament; tip of chin white; posterior end of caudal peduncle encircled with white; anal rays 142 to 158.....*Apteronotus leptorhynchus* (Eigenmann)

2b. Anal fin rays blackish except posteriorly, which may be white; snout elongate, equal to three-fourths to four-fifths length of pectorals and about 3 times in greatest depth; depth of head at occiput $1\frac{1}{2}$ in its length; rear of eye in front of middle of head by more than the distance between the anterior and posterior nostrils or the width of interorbital space; a more or less interrupted white band from snout tip to top of head; a broad band encircling body and anal fin near rear of latter on specimens shorter than 200 mm. total length and on those larger this white band becoming mottled and broken up with black blotches, while in specimens 300 mm. or longer only a trace remaining as a white blotch or so on the anal fin, or it may be lacking; anal rays 176 to 197.

Apteronotus cuchillo, new species

APTERONOTUS ALBIFRONS (Linnaeus)

CUCHILLO

Gymnotus albifrons LINNAEUS, *Systema naturae*, ed. 12, vol. 1, p. 428, 1766 (ref. copied).

Sternarchus albifrons PETERS, *Monatsb. Akad. Wiss. Berlin*, 1877, p. 473 (Río Apure, Venezuela).—SACHS, *Aus den Llanos*, 1879, p. 279 (Apure).—EIGENMANN AND EIGENMANN, *Proc. U. S. Nat. Mus.*, vol. 14, p. 61, 1891 (Apure).—EIGENMANN AND WARD, *Proc. Washington Acad. Sci.*, vol. 7, p. 163, fig. 2, 1905 (Orinoco).—IHERING, *Rev. Mus. Paulista*, vol. 7, p. 273, 1907 (Guianas, Venezuela, Ecuador, Río Amazon to Peru and Río Paraguay).

Apteronotus albifrons EIGENMANN AND ALLEN, *Fishes of western South America*, p. 321, 1942 (Orinoco).

*APTERONOTUS LEPTORHYNCHUS*¹⁴ (Eigenmann)

Sternarchus leptorhynchus EIGENMANN, *Mem. Carnegie Mus.*, vol. 5, p. 439, 1912 (Amatuk; Warraputa).

U.S.N.M. No. 121595, 10 specimens, 103 to 178 mm. in total length, Río San Juan near bridge south of Mene Grande, tributary of Río Motatán, March 17 and 20, 1942.

U.S.N.M. No. 121593, 3 specimens, 94 to 151 mm., Río San Pedro at bridge south of Mene Grande, Motatán system, March 20, 1942.

U.S.N.M. No. 121594, a specimen, 43 mm., Río Negro below mouth of Río Yasa, March 2, 1942.

U.S.N.M. No. 121592, a specimen, 57.5 mm., Río San Juan, 12 km. south of Rosario, February 26, 1942.

APTERONOTUS CUCHILLO, new species

PLATE 3, A

PEZ CUCHILLO

Holotype.—U.S.N.M. No. 121591, 363 mm. in total length, 350 mm. to base of caudal fin and 330 mm. to end of anal fin, collected by Leonard P. Schultz in the Río Socuy, 3 km. above mouth, February 24, 1942.

Paratypes.—All paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

¹⁴ This species has been reported from the Orinoco Basin at Guacáramo, Colombia, and from the Ríos Calima, Saija, and Dagua, western Colombia.

U.S.N.M. No. 121587, 13 specimens, 156 to 385 mm. in total length, collected with the holotype and bearing same data.

U.S.N.M. No. 121589, 11 specimens, 164 to 390 mm., Río Motatán at bridge, 22 km. north of Motatán, March 17.

U.S.N.M. No. 121588, 3 specimens, 215 to 375 mm., Río Palmar at bridge, 70 km. southwest of Maracaibo, March 6.

U.S.N.M. No. 121590, 7 specimens, 132 to 194 mm., Río Apón about 35 km. south of Rosario, February 26.

Description.—The following description was based on the holotype and paratypes. Detailed measurements were made on the former and two of the latter, and these data are expressed in hundredths of the length to end of anal fin and recorded respectively for the holotype and the paratypes in parentheses.

Total lengths 363 (221; 131.5); length to base of caudal fin 350 (213; 128.5); length from tip of snout to end of anal fin 330 (202; 121). Greatest depth of body 15.8 (15.8; 16.8); length of head 16.4 (17.1; 18.4); length of snout 5.60 (5.79; 6.28); least width of interorbital space 1.82 (2.38; 2.89); diameter of eye 0.76 (0.89; 1.16); distance between anterior and posterior nasal openings 1.67 (1.68; 1.98); distance from eye to posterior nasal opening 2.58 (2.23; 2.07); post-orbital length of head 11.8 (11.7; 11.6); length from tip of snout to rictus 3.82 (3.57; 5.12); width of gill opening 2.49 (2.72; 2.89); least depth of caudal peduncle 1.36 (1.24; 1.65); length of caudal peduncle from end of anal fin to midcaudal base 6.58 (5.60; 5.95); snout to occiput 13.8 (13.6; 15.7); snout to anus 8.33 (8.62; 11.7); snout to pectoral insertion 16.7 (16.7; 18.8); snout to anal origin 15.3 (14.8; 11.7); snout to anterior end of groove between dorsal filament and back or rear base of dorsal filament 66.7 (69.0; 65.7); length of longest pectoral fin ray 7.88 (8.90; 8.85); longest anal ray 5.91 (6.68; 7.19); longest caudal fin ray 3.24 (3.46; 3.47).

The following counts were made, respectively: Anal rays 187 (197; 181); pectoral rays ii,16-ii,16 (ii,15-ii,16; ii,16-ii,16); number of pores to end of lateral line 100 (101; 96); 3 scales between base of dorsal filament and lateral line.

Body compressed, caudal region compressed; caudal fin about three-fourths length of snout; caudal peduncle about one-half length of head; pectoral fin length a little over one-half length of head; snout elongate, somewhat pointed, the dorsal profile of head a little concave or straight; greatest depth of body a little behind tips of pectorals; lower edge of gill opening opposite middle of pectoral base or a little below the middle; eye small without a free membrane and contained from 6 to 11 times in the snout; rictus under posterior nostril; anterior nostril tubular; posterior nostril a little closer to eye than tip of snout; anus under a vertical about 2 diameters behind rear of eye; rear edge of base of dorsal filament about equal distance between tip of caudal fin and rear of head or base of pectoral fin;

at about half the distance from tip of snout to base of dorsal filament there are 13 or 14 scales between lateral line and middorsal line; the third or fourth branched rays of pectorals longest; anal rays near middle of that fin longest; lateral line straight, complete, the scales along lateral line and midsides largest, gradually becoming smaller dorsally and ventrally; caudal fin minutely scaled for three-fourths the way out, the last third naked; interorbital sharply convex, about equal to distance between anterior and posterior nostrils and about $3\frac{1}{2}$ in the head; origin of anal under gill opening; tip of lower jaw with a groove separated by a frenum at each side of tip from groove along sides of lower jaw; mouth terminal, lower jaw fitting up between the maxillaries; a small patch of villiform teeth on each side near front of upper jaw; two rows of a few conical teeth at sides of lower jaw; apparently no teeth near symphysis of lower jaw; a long fontanel along middorsal line of head.

Color.—In alcohol the ground color is mottled dark brown or blackish at all ages, but the white color markings are greatly variable with increase in length. A specimen 132 mm. in total length has a cream-white band that encircles the body in the last one-fourth of the anal fin, but the white color does not quite reach to end of anal as the last few rays are blackish; the caudal peduncle is blackish except posteriorly where a second narrow white band encircles it just in front of base of caudal fin; caudal fin and anal fin blackish except posteriorly; tip of chin pale or white; a white band from snout tip along middorsal line to top of head thence represented by a few pale blotches for a short distance along the back; pectorals blackish.

A specimen 250 mm. in total length has the white streak along top of head ending at occiput, and the wide white band near rear of anal is broken up by numerous dark brown blotches, but there is no dark blotch on the anal fin; otherwise coloration as in the specimen 132 mm. long.

In the holotype, 363 mm. long, the pale band at rear of anal is almost lacking, as the sides of the body in that region are blackish, along the midline of back are a few white blotches and part of anal fin is still white; the white band just in front of caudal fin is reduced in width. In the largest specimens the white band at rear of anal may be completely lacking but the narrow white streak at base of caudal fin does not completely disappear.

The peritoneum is pale.

Remarks.—This new species is close to *leptorhynchus* in shape of head and snout but differs from it in having the eye considerably in front of middle of length of head and also in several other respects, as indicated in the key on page 68. In coloration this new species differs from all others referred to the genus *Apteronotus* except *A.*

albifrons, which has the two white bands encircling the body; it differs in its elongate snout, blunt and rounded in *albifrons*, as indicated in the key. *Apteronotus anas* Eigenmann and Allen has the eye far back, considerably behind middle of length of head.

Named *cuchillo*, the common name of this type of fish in Venezuela, probably referring to its knifelike shape.

Genus STERNARCHOGITON Eigenmann and Ward

Sternarchogiton EIGENMANN AND WARD, Proc. Washington Acad. Sci., vol. 7, p. 164, fig. 5, 1905. (Genotype, *Sternarchogiton nattereri* (Steindachner) = *Sternarchus nattereri* Steindachner.)

STERNARCHOGITON CUCHILLEJO, new species

PEZ CUCHILLEJO

PLATE 3, B

Holotype.—U.S.N.M. No. 121600, 168 mm. in total length, and 156 mm. to end of anal base, collected by Leonard P. Schultz in Río Motatán, 8 km. below Motatán, March 24, 1942.

Paratypes.—All the paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121601, 5 specimens, 148 to 177 mm., taken along with the holotype and bearing same data.

U.S.N.M. No. 121599, 47 specimens, 92 to 189 mm., Río Motatán at bridge, 22 km. north of Motatán, March 17.

U.S.N.M. No. 121602, 10 examples, 80 to 115 mm., Río San Pedro at bridge, Motatán system, March 20.

U.S.N.M. No. 121598, 7 specimens, 61 to 148 mm., Río Negro below mouth of Río Yasa, March 2.

U.S.N.M. No. 121603, 2 specimens, 120 to 156 mm., Río Machango, 20 km. above bridge south of Mene Grande, March 21.

Description.—The description is based on the holotype and paratypes listed. Detailed measurements were made on the holotype and one paratype, and these data are recorded below in hundredths of the distance from the tip of the snout to end of anal fin, respectively. Total length 168 (112); length to base of caudal fin 156 (106); and length of snout tip to end of anal fin 130 (89.5).

Greatest depth 15.0 (16.8); least depth of caudal peduncle 1.38 (1.34); length of caudal peduncle from end of anal fin to midcaudal fin base 19.6 (22.3); length of head 14.4 (15.3); snout 4.62 (5.25); interorbital 4.00 (4.69); eye 2.00 (1.79); distance between anterior and posterior nostrils 1.85 (2.13); postorbital length of head 9.39 (9.50); least width of preorbital space 2.92 (3.13); tip of upper lip to occiput 11.3 (12.0); length from tip of upper lip to rear edge of maxillaries or rictus 5.15 (6.14); width of gill opening 2.54 (2.13); tip of snout to anus 8.85 (10.6); snout to pectoral insertion 15.8 (16.7);

snout to anal origin 13.5 (14.6); snout to anterior edge of groove between dorsal filament and back 63.8 (64.5); length of longest pectoral ray 9.23 (9.28); length of longest anal fin ray 7.69 (6.93); length of longest caudal fin ray 6.70 (6.37).

The following counts were made: Anal rays 146 (139); pectoral rays ii, 12-ii, 11 (ii, 12—); pores from rear of head to opposite end of anal fin 60 (64).

Body compressed throughout its length, the greatest depth 5.25 to 6½ in length to end of anal fin and 6.5 to 7.75 in total length; head 6 to 7.25 in length to end of anal and 8 to 9 in total length; eye small, about 3 to 3.5 in snout and about equal to distance between anterior and posterior nasal openings, the anterior pair tubular; eye considerably in front of middle of length of head; gape of mouth large, rictus under eye; mouth terminal; upper jaw toothless; lower jaw with two rows of short conical teeth at sides, the symphyseal region toothless; lower jaw fitting between the upper but the maxillaries fit into a groove of the lower lip at sides of lower jaw; lower lip broad, fleshy, and free from lower jaw anteriorly, without a frenum; gill opening extending down in front of middle of pectoral fin base; the third or fourth branched pectoral rays longest; rear of base of dorsal filament or the most anterior extent of groove between filament and back is an equal distance between base of caudal fin and postorbital length of head; origin of anal fin behind the middle of the opercle; interorbital space greatly convex, 3.5 to 3.75 in the head; dorsal profile convex; pectoral fin about 1½ in the head; body covered with scales; caudal fin scaled nearly to tips of rays; midline of back naked, with a row of scales up to caudal peduncle; scales largest along midsides and on lateral line, smaller toward back; posteriorly on caudal region the scales along lateral line are much longer than high and the pores in lateral line number from 56 to 64; 3 scales from rear base of dorsal filament to lateral line; lateral line straight, much closer to back than ventral side of body and on caudal peduncle the lateral line is dorsal in position; caudal fin present, middle rays longest; head with an elongate fontanel along middorsal line; gill rakers short, few, 1 or 2 + 3 or 4.

Color.—In alcohol, ground color dark brown, fins hyaline, except caudal which is dark brown, with its tip white; a prominent white streak extends from tip of snout along middorsal line to base of dorsal filament, thence dorsal filament is pale; chin with white blotch; body and especially head profusely covered with mucus pores, which are white; posterior end of caudal peduncle encircled with white; peritoneum pale along midventral line, but pigmented on sides.

Remarks.—This new species may be distinguished from all other species referred to the genus *Sternarchogiton* by its fewer number of

anal rays, 137 to 146, instead of more than 190 as well as in its coloration. In addition, there are two irregular rows of teeth on each side of the lower jaw instead of a single row in the other species. This tooth character may be of significance generically. The following key may be used to identify the species referred to *Sternarchogiton*:

1a. Anal rays about 197 or 200; sides of lower jaw with a single row of teeth; no pale streak along middorsal line.

2a. Head about 12 in length; eye about $3\frac{1}{2}$ in the head.

S. nattereri (Steindachner)

2b. Head about 9 in length, eye 7 in snout; posterior half of pectoral rays dark and distal part of anal rays blackish. *S. porcinum* Eigenmann and Allen

1b. Anal rays 137 to 146; 2 rows of short conical teeth on sides of lower jaw; middorsal line of back with pale streak anteriorly; pale blotch on chin; head 8 to 9 in total length; eye 3 to $3\frac{1}{2}$ in snout; fins all pale in color.

S. cuchillejo, new species

Some of the females have pale amber-colored eggs in their ovaries and appear to be nearly ready to spawn.

Named *cuchillejo* for the popular name of this small knife-shaped fish.

Genus ADONTOSTERNARCHUS Ellis

Adontosternarchus ELLIS, Mem. Carnegie Mus., vol. 6, No. 3, p. 155, 1913. (Genotype, *Sternarchus sachsii* Peters.)

ADONTOSTERNARCHUS SACHSI (Peters)

PEZ CUCHILLO DE LAS LLANOS

Sternarchus sachsii PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 473 (San Fernando de Apure, Venezuela).—SACHS, Aus den Llanos, 1879, pp. 153, 367, fig. on p. 279 (Apure).—EIGENMANN AND EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 62, 1891 (Apure).—EIGENMANN AND ALLEN, Fishes of western South America, p. 326, 1942 (Orinoco).—RÖHL, Fauna descriptiva de Venezuela, p. 377, fig. 189, 1942 (Orinoco).

Sternarchogiton sachsii EIGENMANN AND WARD, Proc. Washington Acad. Sci., vol. 7, p. 165, 1905 (Orinoco).

Family GYMNOTIDAE

Genus GYMNOTUS Linnaeus

Gymnotus LINNAEUS, Systema naturae, ed. 10, p. 246, 1758; ed. 12, vol. 1, p. 427, 1766. (Genotype, *Gymnotus carapo* Linnaeus.)

GYMNOTUS CARAPO Linnaeus

GIMNOTO

Gymnotus carapo LINNAEUS, Systema naturae, ed. 10, p. 246, 1758.—EIGENMANN, Indiana Univ. Stud., vol. 7, No. 44, p. 12, 1920 (Maracay, Río Bue, Venezuela).

Carapus fasciatus PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

Family ELECTROPHORIDAE

Genus ELECTROPHORUS Gill

ELECTRIC EEL

Electrophorus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 151. (Genotype, *Gymnotus electricus* Linnaeus.)

ELECTROPHORUS ELECTRICUS (Linnaeus)

ANGUILA ELÉCTRICA O TEMBLADOR

Gymnotus electricus LINNAEUS, Systema naturae, ed. 12, vol. 1, p. 427, 1766.—PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 473 (Calabozo, Venezuela).—SACHS, Aus den Llanos, 1879, p. 153, figs. on pp. 149, 154 (Apure).

Electrophorus electricus EIGENMANN AND ALLEN, Fishes of western South America, p. 330, 1942 (Venezuela).—RÖHL, Fauna descriptiva de Venezuela, p. 379, fig. 191, 1942 (Orinoco).

Suborder CYPRINOIDEA

Family CYPRINIDAE

Genus CYPRINUS Linnaeus

MINNOWS

Cyprinus LINNAEUS, Systema naturae, ed. 10, p. 320, 1758. (Genotype, *Cyprinus carpio* Linnaeus.)

CYPRINUS CARPIO Linnaeus

CARP; CARPA

Cyprinus carpio LINNAEUS, Systema naturae, ed. 10, p. 320, 1758.

This species has been introduced into Venezuelan waters and on April 3, 1942, I observed several in a small pond at Estanques, Mérida.

Suborder NEMATOGNATHOIDEA: Catfishes; Bagres

My first report on the collections of fishes that I made during 1942 in Venezuela covered this group. The publication is entitled "The Catfishes of Venezuela, with Descriptions of Thirty-eight New Forms," and it appeared in the Proceedings of the United States National Museum, volume 94, pp. 173-338, figs. 1-5, pls. 1-14, February 11, 1944. This report contains an itinerary of my travels and a map showing the localities where specimens were collected, along with a list of collecting stations. For all of Venezuela 127 species and subspecies in 63 genera and 12 families are listed.

Since the publication of this report two papers have appeared under my authorship on the catfishes of Venezuela: "Two New Species of Fishes (Gymnotidae, Loricariidae) from Caripito, Venezuela," Zoologica, New York, vol. 29, pt. 1, pp. 39-44, fig. 1, 2, pl. 1, May 10,

1944, and "*Pygidium monodolphi*, A New Catfish from Venezuela," Journ. Washington Acad. Sci., vol. 35, No. 1, pp. 29-31, fig. 1, January 15, 1945 (near Caracas). In addition I have published two other recent papers on catfishes from Colombia: "A New Loricariid Catfish from the Río Truando, Colombia," Copeia, 1944 No. 3, pp. 155-156, September 30, and "A New Genus and Species of Pimelodid Catfish from Colombia," Journ. Washington Acad. Sci., vol. 34, No. 3, pp. 93-95, fig. 1, March 15, 1944.

A few errors in my report on the catfishes of Venezuela have been observed, and I take this opportunity to correct some of the more important ones. On page 182, 11a should read *without*, and on the next page 3b, next to last line should read 6 + 11 or 12 instead of 6 + 17. The tenth line, third paragraph p. 335, should read 47.6, not 4.76.

Addenda to my report on the catfishes of Venezuela, 1944:

1. *Hexanemathichthys rugispinis* (Cuvier and Valenciennes). 1 specimen 275 mm., from mouth of Río San Juan, near Caripito, April 11, 1942. William Beebe.
2. *Selenaspis herzbergi* (Bloch). 1 specimen for each—C.N.H.M. Nos. 41990 and 41989, from Lago de Maracaibo, W. H. Osgood, 1911.
3. *Pimelodus clarias coprophagus* Schultz. 1 specimen each, C.N.H.M. Nos. 41988, 42011, 42013, 42014, 42015, from Encontrados, W. H. Osgood, 1911.
4. *Pseudopimelodus villosus butcheri* Schultz. Gomes, Occ. Pap. Mus. Zool. Univ. Michigan, No. 494, p. 4, 1946 (Río San Juan, near Mene Grande, Venezuela).
5. *Microglanis poecilus* Eigenmann. Gomes, Occ. Pap. Mus. Zool. Univ. Michigan, No. 494, p. 15, 1946 (Caño de Quiribana, Río Apure into Río Orinoco, Venezuela).
6. *Microglanis iheringi* Gomes, Occ. Pap. Mus. Zool. Univ. Michigan, No. 494, p. 9, pl. 1, 1946 (Río Turmero near Turmero, Aragua; Carabobo, Venezuela).
7. *Perrunichthys*. Recently a skin and head of a species in this genus was found in the National collections collected by Prof. Orton probably at the junction of the Napo and Marañón Rivers of the upper Amazon. This head with skin definitely represents a species distinct from *P. perruno* Schultz of the Maracaibo Basin, but a better specimen should be obtained before describing and naming it.
8. *Dupouyichthys sapito* Schultz. Cecil Miles, of Colombia, wrote to me on July 2, 1945, that a man collecting for him in the Magdalena system just brought a specimen of this species with 6 or 7 almost fully developed eggs adhering to the pelvic fins and the preanal region. Mr. Miles is to be highly complimented on the discovery of this remarkable habit of incubation of eggs for the genus, although such a type of egg incubation is known for certain Asiatic catfishes. He published on this in *Caldasia*, vol. 3, No. 15, p. 454, 1945.
9. *Pygidium conradi* Eigenmann. 9 specimens, 20 to 33 mm., from Guachaco Cave, Río Caripe near Caripito, William Beebe, 1942.
10. *Ochmacanthus flabelliferus* Eigenmann. 1 specimen, 37 mm., East Caripito Creek, William Beebe, March 6, 1942.
11. *Callichthys callichthys* (Linnaeus). 2 specimens, 100 and 125 mm., from Caripito, William Beebe, May 7, 1942.
12. *Hoplosternum thoracatum thoracatum* (Cuvier and Valenciennes). 2 specimens, 67 and 77 mm., Río Pablo, Caripito, William Beebe, March 19, 1942.
13. *Hoplosternum littorale* (Hancock). 1 specimen, 117 mm., Río San Pablo, Caripito, William Beebe, March 19, 1942.
14. *Ancistrus brevifilis brevifilis* Eigenmann. 1 specimen, C.N.H.M. No. 35341, Río Turmero, Venezuela, Ventura Barnés, September 24, 1937.

15. *Ancistrus brevifilis bodenhameri* Schultz. 3 specimens, C.N.H.M. Nos. 41999 to 42001, Río Coguollo, Sierra Perijá, Venezuela, Osgood and Conover, March 1920.

16. *Hypostomus watwata* Hancock. 1 specimen each, C.N.H.M. Nos. 41995 and 41996, from Lago de Maracaibo, W. H. Osgood, 1911.

17. *Loricaria typus* (Bleeker). 1 specimen, 255 mm., from Caripito, Venezuela, William Beebe, 1942.

18. *Loricaria caracasensis* (Bleeker). Described by Bleeker in his "Systema Silurorum Revisum," Nederl Tijdschr. Dierk., vol. 1, p. 81, 1863, as *Hemiloricaria caracasensis* Bleeker, from Caracas. It is the genotype of *Hemiloricaria*, a monotypic genus.

Bleeker described this species as follows: "Velum labiale vix fimbriatum postice latum, antice angustum. Dentes utraque maxilla conspicui. Cristae occipitales vel nuchales dentatae nullae. Scuta trunco carina dentata. Regio subthoracicoanalis scutata. Pinna dorsalis supra ventrales incipiens.

"Spec. typ. *Hemiloricaria caracasensis* Blkr. sp. nov in Mus. L. B. sub. nom. *Loricariae*. (Caracas) Conserv."

Not having any specimens from the Río Guaire at Caracas, I am unable to determine the species from Bleeker's description.

19. *Loricaria eigenmanni* Pellegrin, Bull. Soc. Zool. France, vol. 33, p. 125, 1908 (Sarare, Venezuela). This species was omitted.

20. *Forlowella acus* (Kner). 3 specimens 94 to 134 mm., from Río Pablo, Caripito, William Beebe, March 19, 1942.

21. *Spathuloricaria* may represent the adult male of some species of *Loricaria*.

22. *Chaetostoma dupouii* Yepes (Mem. Soc. Cien. Nat. La Salle, Caracas, año 5, No. 14, pp. 27-34, figs. 1945) (Río Encanthado into Río Grande of Río Tuy system, Venezuela.)

Order APODOIDEA

Family MURAENIDAE: Morays

Genus GYMNOTHORAX Bloch

Gymnothorax BLOCH, Naturgeschichte der ausländischen Fische, vol. 9, p. 83, 1794. (Genotype, *Gymnothorax reticularis* Bloch as restricted by Bleeker, Nederl. Tijdschr. Dierk., vol. 2, p. 121 (9), 1865 = *G. ruppelli* McClelland.)

The following species recorded from Venezuelan waters may be traced down by the following key extracted from that in Meek and Hildebrand's "The Marine Fishes of Panama," vol. 1, pp. 162-163, 1923.

1a. Teeth all entire, without serrations.

2a. Body mottled with dark brown or slightly purplish spots; lower jaw with about 22 teeth on side; tail longer than rest of body by about two-thirds length of head.-----*Gymnothorax vicinus* (Castelnau)

2b. Body everywhere mottled or reticulated with pale or light yellow, varying among individuals; tail a little longer than head and trunk; snout short, about 6 in head.-----*Gymnothorax moringa* Cuvier

1b. Teeth serrate, at least at base of posterior margin; body with irregular light yellowish spots, variable in size and number, often making the ground color appear as brown reticulations; dorsal fin with large black spots, sometimes running together and forming a black band; anal with a dark edge.

Gymnothorax ocellatus Agassiz

GYMNOTHORAX VICINUS (Castelnau)

Murenophis vicina CASTELNAU, Animaux nouveaux ou rares recueillis dans les parties centrales de l'Amérique du Sud, vol. 2, pt. 7, Zool., Poissons, p. 81, pl. 42, fig. 4, 1855 (Bahia).

Gymnothorax vicinus TORTONESE, Bol. Mus. Zool. Anat. Comp. Univ. Torino, vol. 47, No. 89, p. 51, 1939 (Puerto Cabello, Venezuela).

GYMNOTHORAX MORINGA Cuvier

MORENA

Gymnothorax moringa CUVIER, Le règne animal, ed. 2, vol. 2, p. 352, 1829 (Bahamas) (ref. copied).—RÖHL, Fauna descriptiva de Venezuela, p. 375, fig. 187, 1942 (coast of Venezuela).

Muraena (Gymnothorax) moringa METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies, 1904–1905, p. 18, 1919 (Venezuela).

GYMNOTHORAX OCELLATUS Agassiz

Gymnothorax ocellatus AGASSIZ, in Spix and Agassiz, Selecta genera et species piscium . . . Brasiliam . . . , p. 91, pl. 50b, 1831 (mouth of large Brazilian equatorial rivers).

Muraena (Priodonophis) ocellata METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904–1905, p. 19, 1919 (Venezuela)

Family ECHELIDAE: Worm Eels

Genus MYROPHIS Lütken

Myrophis LÜTKEN, Vid. Medd. Nat. For. Kjøbenhavn, 1851, p. 1. (Genotype, *Myrophis punctatus* Lütken.) (Ref. copied).

An excellent key to the species of the genus *Myrophis* occurring in the Atlantic is given by Dr. A. E. Parr in the Bulletin of the Bingham Oceanographic Collection, vol. 3, No. 4, p. 9, 1930.

MYROPHIS PUNCTATUS Lütken

Myrophis punctatus LÜTKEN, Vid. Medd. Nat. For. Kjøbenhavn, 1851, p. 1 (West Indies) (Ref. copied).

U.S.N.M. No. 123169, 1 specimen, 197 mm. in total length, from Cape San Román, April 2, 1925.

Order SYNBRANCHIOIDEA

Family SYNBRANCHIDAE

Genus SYNBRANCHUS Bloch

Synbranchus BLOCH, Naturgeschichte der ausländischen Fische, vol. 9, p. 86, 1795. (Genotype, *Synbranchus marmorata* Bloch.)

SYNBRANCHUS MARMORATUS Bloch

Synbranchus marmoratus BLOCH, Naturgeschichte ausländischen Fische, vol. 9, p. 86, 1795.—ERNST, Estudios sobre la flora y fauna de Venezuela, p. 282, 1877 (creeks near Caracas).

Symbranchus marmoratus PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 473 (Calabozo, Venezuela).—EIGENMANN, Indiana Univ. Studies, vol. 7, No. 44, p. 13, 1920 (Isla del Buro; rocks on shores of Lake Valencia and mud at depth of 15 meters; Río Guaire, near Caracas, and at Caracas; Maracay; all in Venezuela).—PEARSE, Univ. Wisconsin Studies, No. 1, p. 23, 1920 (Isla del Buro, Lago de Valencia, Venezuela).

4 specimens, 82 to 104 mm., near Caripito, William Beebe, May 6, 1942.

3 specimens, 88 to 108 mm., near Caripito, William Beebe, April 11, 1942.

Order SYNENTOGNATHOIDEA

Family BELONIDAE: Needlefishes; Peces agujas, o Agujones

KEY TO THE NEEDLEFISHES REPORTED FROM VENEZUELA

1a. Postorbital length of head about equal to base of anal fin, much longer than base of dorsal fin, and contained about 2.5 times in distance from insertion of pectoral fins to that of pelvic fins; longest pelvic fin ray about 1.5 times in longest pectoral fin ray; caudal fin not forked but deeply concave, lower lobe a little longer than upper; side of body with a blackish streak; postorbital length of head about 1.9 in snout, 1.1 in anal fin base, and 0.8 in dorsal fin base; dorsal origin notably behind anal origin.

Potamorrhaphis guianensis (Schomburgk)

1b. Postorbital length of head much shorter than length of anal fin base, about equal to or much shorter than base of dorsal fin and contained more than 3 times in distance from insertion of pectoral fins to that of pelvic fins.

2a. Longest pelvic fin ray nearly equal to longest pectoral fin ray; caudal fin forked, lower lobe longest, pointed; dorsal origin nearly over anal origin; postorbital length of head contained about 2.5 in snout, 2.2 in anal fin base and 2.5 in that of dorsal fin; side of body without dark lengthwise streak-----*Strongylura raphidoma* (Ranzani)

2b. Longest pelvic fin ray about 2 or more than 2 times in longest pectoral fin ray; caudal fin not forked but posterior margin concave, lobes rounded; dorsal origin notably behind anal fin origin; postorbital length of head contained from 2.75 to 3 in snout, 1.6 in anal fin base, and 1.4 in dorsal fin base; side of body with a black streak running lengthwise.

Strongylura timucu (Walbaum)

Genus POTAMORRHAPHIS Günther

Potamorrhaphis GÜNTHER, Catalogue of the fishes in the British Museum, vol. 6, p. 256, 1866. (Genotype, *Belone taeniata* Günther.)

POTAMORRHAPHIS GUIANENSIS (Schomburgk)

Belone guianensis SCHOMBURGK, The natural history of the fishes of [British] Guiana, vol. 2, p. 131, pl. 1, 1843 (Guiana; Paduiri) (ref. copied).

One specimen, 225 mm., Río Apure at San Fernando de Apure, F. F. Bond, February 16, 1938.

Genus STRONGYLURA van Hasselt

Strongylura VAN HASSELT, Alg. Konst. Letter-Bode, No. 35, 1823; Bull. Sci. Nat. Férussac, vol. 2, p. 374, 1824. (Genotype, *S. caudimaculata* van Hasselt = *Belone strongylura* van Hasselt, 1823.) (Ref. copied.)

STRONGYLURA RAPHDOMA (Ranzani)**AGUJA DE MAR O MONO**

Belone raphidoma RANZANI, Novi Comment. Acad. Sci. Inst. Bonon., vol. 5, p. 359, pl. 37, figs. 1-5, 1842 (Brazilian seas).

Tylosurus raphidoma RÖHL, Fauna descriptiva de Venezuela, p. 375, 1942 (coast of Venezuela).

STRONGYLURA TIMUCU (Walbaum)**AGUJA**

Esox timucu WALBAUM, in Artedi's Bibliotheca ichthyologica, vol. 3, p. 88, 1792 (Brazil) (after *Timucu* of Maregrave).

U.S.N.M. No. 121782, 5 specimens, 218 to 235 mm. in standard length, Lago de Maracaibo at Yacht Club, Maracaibo, March 5, 1942.

U.S.N.M. No. 121784, 7 specimens, 72 to 128 mm., from Lago de Maracaibo at Yacht Club, Maracaibo, May 16, 1942.

U.S.N.M. No. 121783, 3 specimens, about 73 to 80 mm. (beaks broken), from Lago de Maracaibo, 2 miles off Lagunillas, March 15.

U.S.N.M. No. 121784, 3 specimens, about 67 to 208 mm., Lago de Maracaibo, 1 km. off Pueblo Viejo, April 7-8.

U.S.N.M. No. 121781, 5 specimens, 574 to 690 mm., from mouth of Río Concha, and in Lago de Maracaibo, May 2.

The base of the caudal fin of two specimens, 48 and 49 mm., Río Apure at San Fernando de Apture, F. F. Bond, February 16, 1938, has a distinct black spot not observed in those of small size from the Maracaibo Basin.

The large specimens from Lago de Maracaibo at the mouth of the Río Concha were apparently ready for spawning, as a light pressure on the abdomen of the females caused pale yellowish eggs to flow freely. The eggs probably adhere to the vegetation, as they appear to possess fine adhesive threads and were very sticky when touched.

Family HEMIRAMPHIDAE: Halfbeaks

The identifications for this family were made by Dr. Robert R. Miller, former associate curator of fishes, United States National Museum, during his investigation of this group of fishes for the purpose of describing a new species from Mexico.

Genus HYPORHAMPHUS Gill

Hyporhamphus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1859, p. 131. (Genotype, *Hyporhamphus tricuspidatus* Gill = *Hemiramphus unifasciatus* Ranzani.)

HYPORHAMPHUS ROBERTI (Valenciennes)**HALFBEAK; BALAO O BALAJÚ**

Hemiramphus roberti VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 19, p. 24, 1846 (Cayenne).

U.S.N.M. No. 121818, a specimen, 57 mm. in standard length, Lago de Maracaibo at Yacht Club, Maracaibo, May 16, 1942.

U.S.N.M. No. 121816, a specimen, 103 mm., caño at Los Monitos, Río Limón system, March 11, 1942.

U.S.N.M. No. 121819, a specimen, 96.5 mm., Lago de Maracaibo, 7 km. south of Maracaibo, March 6, 1942.

U.S.N.M. No. 121725, 2 specimens, 106 and 121 mm., Lago de Maracaibo at Yacht Club, Maracaibo, February 27, 1942.

U.S.N.M. No. 121820, 33 specimens, 14 to 102 mm., Lago de Maracaibo, 1 km. off Pueblo Viejo, April 7-8, 1942.

U.S.N.M. No. 121817, 12 specimens, 87 to 142 mm., Lago de Maracaibo at Yacht Club, Maracaibo, March 5, 1942.

HYPORHAMPHUS UNIFASCIATUS (Ranzani)

Hemiramphus unifasciatus RANZANI, Novi Comment. Acad. Sci. Inst. Bonon., vol. 5, p. 326, 1842 (Brazil) (ref. copied).

U.S.N.M. No. 123285, 1 specimen 195 mm. in standard length, Estanques Bay, U. S. S. Niagara, December 19, 1924.

Genus HEMIRAMPHUS Cuvier

Hemi-ramphus CUVIER, Le règne animal, vol. 2, p. 186, 1817. (Genotype, *Esox brasiliensis* Linnaeus.)

HEMIRAMPHUS BRASILIENSIS (Linnaeus)

BALAJÚ

Esox brasiliensis LINNAEUS, Systema naturae, ed. 10, p. 314, 1758 (Jamaica).

Hemiramphus brasiliensis RÖHL, Fauna descriptiva de Venezuela, p. 374, fig. 186, 1942 (coast of Venezuela).

Family EXOCOETIDAE: Flyingfishes

Genus EXOCOETUS Linnaeus

Exocoetus LINNAEUS, Systema naturae, ed. 10, p. 316, 1758. (Genotype, *Erocoetus volitans* Linnaeus.)

EXOCOETUS VOLITANS Linnaeus

PEZ VOLADOR

Exocoetus volitans LINNAEUS, Systema naturae, ed. 10, p. 316, 1758 (Atlantic Ocean).—BREDER, Bull. Bingham Oceanogr. Coll., vol. 6, art. 5, p. 30, figs. 15, 17, 1938 (one station at entrance to Gulf of Venezuela).

Order CYPRINODONTOIDEA¹⁵

KEY TO THE CYPRINODONTS REPORTED FROM VENEZUELA

1a. Eyes bulging, in elevated sockets, the pupil divided by a horizontal cross partition, adapting the eye for vision above and below the surface of the water; anal fin of male with a scaly tube; space between upper edges of orbital ridges or rims equal to or less than diameter of eye; sides with obscure stripes; scales 81 to 90, 17 or 18 in a transverse series; caudal fin obliquely rounded (after Eigenmann) (family Anablepidae).

Anableps microlepis Müller

1b. Eyes normal, without cross partition.

2a. Orbital rim with its margin not free but fused with eye; first rays of anal fin of male not specialized (family Cyprinodontidae).

¹⁵ *Lima heterandria* Regan (1913, p. 1017, pl. 101, figs. 3, 4, La Guaira, Venezuela) actually came from Santo Domingo according to Myers (1940, p. 172). *Heterandria zonata* Nichols, 1915, is a synonym. Dr. Hubbs has found that this species is a new one and that it actually came from La Guaira.

- 3a. Caudal peduncle greatly compressed, its lower edge bladelike; fins, especially caudal and pelvic, pointed and often greatly attenuated; dorsal rays about 10, origin considerably behind a vertical through anal origin over the base of the fourteenth anal ray; anal rays 22; color in alcohol dull yellowish brown with 11 narrow dark vertical bars on the sides, the last on the caudal peduncle; caudal fin with small blackish spots; scales about 34; pectoral rays 13; 12 scales from dorsal base to anal origin; about 28 or 29 predorsal scales to opposite pupil; 16 around caudal peduncle.-----**Pterolebias zonatus** Myers
- 3b. Lower edge of caudal peduncle not bladelike; cleft of mouth forming a right-angled groove or pocket in front of eye; preorbital line nearly vertical or even inclined slightly backward.
- 4a. Dorsal rays 13 to 16; base of dorsal fin a little longer than that of anal fin; dorsal fin origin a little behind that of anal fin, usually over bases of first or second branched anal rays in females; anal rays 16 to 18; scales from upper edge of gill opening to caudal fin base 30 to 33 and usually 12 or 13 scales from anal origin to dorsal base; teeth in each jaw conical, recurved, in a relatively wide band of several irregular rows, the outer row considerably enlarged and widely spaced; caudal fin slightly but usually truncate; interradi al membrane of caudal fin with fine scales in adults, lacking in half-grown and young.-----**Austrofundulus** Myers
- 5a. Number of scales in a zigzag row across breast between bases of pectoral fins about 5 or 6 and number of scales from lower edge of pectoral base to pelvic insertion about 9; greatest width of upper lip into length of upper lip between nostrils 3.8; length of pectoral fin into standard length $6\frac{1}{2}$ times; coloration not known.
Austrofundulus transilis transilis Myers
- 5b. Number of scales across breast between pectoral bases 7 to 11 and from pectoral base to pelvic insertion 9 to 12; greatest width of upper lip into length of upper lip 3.9 to 4.6; length of pectoral fin into standard length 4.5 to 4.8; a dark bar below eye more or less obscure on females; anterior parts of body with black spots faint or absent on females; fins plain in color.
Austrofundulus transilis limnaeus, new subspecies
- 5c. Number of scales across breast between pectoral bases 10 to 14 and from pectoral base to pelvic insertion 12 to 14; greatest width of upper lip into length of upper lip 2.5 to 3.6; length of pectoral fin into standard length 3.8 to 4.5; bar below eye barely visible; body plain in color; basal parts of both dorsal and anal fins with several darkish spots just visible, the row of 4 or 5 at base of fin most intense.-----**Austrofundulus stagnalis**, new species
- 4b. Dorsal fin base much shorter than anal fin base; dorsal origin considerably behind that of anal fin; all fins rounded, no produced pelvic rays.
- 6a. Dorsal rays 8 to 10; head considerably wider than its greatest depth; body but little compressed, elongate (*Rivulus* Poey).
- 7a. Scales from upper edge of gill opening to midcaudal fin base about 29; origin of dorsal three-fourths the distance from middle of the eye to base of caudal fin; origin of anal halfway from head to caudal; origin of dorsal nearly over middle of anal base; anal rays 6, dorsal 8.-----**Rivulus obscurus** Garman
- 7b. Scales 35 to 43; origin of dorsal usually a little behind middle of anal base.

8a. Branched rays of dorsal 5 or 6, usually 6; of anal 11 to 14; total rays of pectoral 13 to 15; scales 35 to 38; 3 or 4 rows of spots on lower half of body most prominent.

Rivulus hartii (Boulenger)

8b. Branched rays of dorsal 8; of anal 13 to 15, seldom 13; total rays of pectoral 15 to 17; scales 37 to 41; two rows of spots on lower side of young and half grown most prominent.

Rivulus holmiae Eigenmann

8c. Branched rays of dorsal 6 or 7, occasionally 6; of anal 12 to 15, usually 14; total rays of pectoral 14 to 16; scales 38 to 41; all rows of spots on females and young of about same prominence.-----*Rivulus bondi*, new species

6b. Dorsal rays 11 or 12; head as deep as broad; body compressed, tail more so; anal rays 12 or 13; pectoral 14; scales 30 to 32, 10 or 11 below origin of dorsal; color brownish, upper parts of head and back darker; scales of opercle each with a large white or bluish white spot; some scales of preopercle with similar spots, similar but smaller spots scattered on some of the scales of the body and tail; a dusky vertical band through eye and suborbital region, a less distinct one along hind border of preopercle; dorsal, sometimes anal and pelvics, with rows of dusky spots; caudal dusky, with vertical rows of dark spots, but lower lobe of fin pure white, sharply contrasting with the rest.---*Rachovia hummelincki* De Beaufort

2b. Orbital rim with a free margin.

9a. Anal rays of males unmodified.

10a. Teeth in both jaws in a single series of 3-pointed incisors, with middle point a little longer and broader; origin of dorsal fin midway between caudal fin base and snout; anal origin under rear of dorsal fin base or a little behind base; depth $2\frac{1}{2}$ to $2\frac{3}{4}$, head 2.7 to 2.9 in standard length; gill membranes broadly united with a wide free fold across the isthmus; about 23 or 24 rows of scales from head to midcaudal fin base; humeral scale enlarged; dorsal rays ii, 8 or ii, 9; anal rays usually ii, 8; a narrow blackish bar across base of caudal fin; sides of body with dark bars or males may lack the dark bars and have a dark streak along middle of sides; dorsal and anal fins often with a black spot posteriorly except in mature males; an elongate black bar occurs at front of fins; also in the males the fins are more elongate and more heavily pigmented.

Cyprinodon dearborni Meek

10b. Teeth simple, conical, in two series at front of both jaws; diameter of eye greater than length of snout; interorbital flat; maxillary and anterior edge of preorbital oblique, the upper corner farther forward than lower; no angular pocket formed at dorsal edge of preorbital; dorsal origin equidistant between midcaudal fin base and front of margin of eye; anal origin very slightly closer to rear margin of eye than midcaudal fin base; anal origin behind a vertical line through dorsal origin; caudal fin rounded; gill rakers short, about 10 on lower part of first gill arch; the row of scales along middle of sides much larger than those above and below this row; dorsal rays i, 12; anal iii, 7; pectoral rays 15-15; pelvics 7-7; scales 32; scales before dorsal 9 + 3 or 4 enlarged ones on top of head; scales in zigzag row around caudal peduncle 14, and 8 from dorsal origin to anal fin base; about 12 scales on breast in front of pelvics, the middle row not regularly placed and not enlarged.

Hubbsichthys laurae, new genus and species

9b. Anal fin of males modified, the first 3 branched rays or rays 3, 4, and 5 greatly elongate with remarkably developed and specialized tips; dorsal origin in middle of length from caudal fin base and postorbital part of head; teeth, minute conical, in villiform bands on jaws; depth and head more than 3 times in the standard length; pelvic fins enlarged and modified in the male, the first ray with a swollen tip, the second ray thickened and greatly elongate; a membranous swelling along anterior margin of gonopodium modified into a prepuce-like hood (family Poeciliidae).

11a. Ray 3 of anal fin with retrorse spines along anterior margin, the proximal spine-bearing segments subspinous on posterior margin and no terminal hook; tips of all rays slender; origin of dorsal fin of female scarcely behind that of anal; subdistal segments of anterior branch of ray 4 short and spiniferous; processes of ray 5 distinctly spinous; usually a blackish spot a little above midaxis near tip of pectoral fin; upper and lower edges of caudal fin base often edged with blackish; scale rows along side behind head to caudal fin base about 24 or 25.

Poecilia vivipara Bloch and Schneider

11b. Ray 3 without processes on posterior margin and terminal hook weakly or not at all developed.

12a. Spines on anterior margin of ray 3 strong but terminal hook wholly undeveloped; tips of all rays of gonopodium slender; anterior branch of ray 4 often with weak serrae on posterior margin; males variously black spotted and with black streaks, the females plain in coloration; scale rows head to caudal fin base 25 to 27; pectoral fins usually ii, 12; dorsal ii, 6; no black spot on dorsal fin and no vertical dark bars.-----**Lebistes reticulatus** (Peters)

12b. Sides of males with vertical darkish bars, a little wider than pale interspaces, these bars mostly absent on females, the width of the dark bars about equal to that of pupil and usually two of these dark bars beyond tip of depressed dorsal fin; dark bars fading ventrally and dorsally; dorsal fin with a large black blotch basally on posterior rays, base of anterior rays hyaline; middle of dorsal fin hyaline, then tips of dorsal rays blackish; prepuce-like hood at tip of third anal ray usually blackish or grayish; about 26 or 27 scales; dorsal rays ii, 6, anal iii, 6 (Maracaibo Basin).

Mollienisia caucana (Steindachner)

12c. Ray 3 with long more or less spinous processes on posterior margin; terminal hook of ray 3 usually weakly developed; tips of all the gonopodial rays slender; segments of anterior branch of ray 4 without trace of serrae and not markedly elongate; anterior margin of ray 3 with strong spines; origin of dorsal approximately over that of anal in female; dorsal and caudal fins with numerous small black spots or in young a small blackish spot or group of spots near midcaudal fin base; sides of body without or with indistinct narrow vertical bars; about 26 or 27 scale rows; pectoral rays usually ii, 12 or 13; dorsal rays ii, 6, anal iii, 6.

Mollienisia spheonops vandepolli (Van Lidth de Jeude)

Family ANABLEPIDAE

Genus ANABLEPS Scopoli

Anableps SCOPOLI, *Introductio ad historiam naturalem*, p. 450, 1877. (Genotype, *Cobitis anableps* Linnaeus.)

ANABLEPS MICROLEPIS Müller

FOUR-EYED-FISH; CUATRO OJOS

Anableps microlepis MÜLLER, Monatsb. Verh. Ges. Erdkunde Berlin, 1844, p. 36.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 436 (Pedernales, Venezuela); 1916 p. 439 (Pedernales, Venezuela).

Family CYPRINODONTIDAE

Genus PTEROLEBIAS Garman

Pterolebias GARMAN, Mem. Mus. Comp. Zool., vol. 19, p. 141, 1895. (Genotype, *Pterolebias longipinnis* Garman.)

PTEROLEBIAS ZONATUS Myers

Pterolebias zonatus MYERS, Proc. Biol. Soc. Washington, vol. 48, p. 7, 1935 (Estado de Guárico, in ponds in Orinoco Basin, Venezuela).

U.S.N.M. No. 92190, holotype of *P. zonatus* Myers.

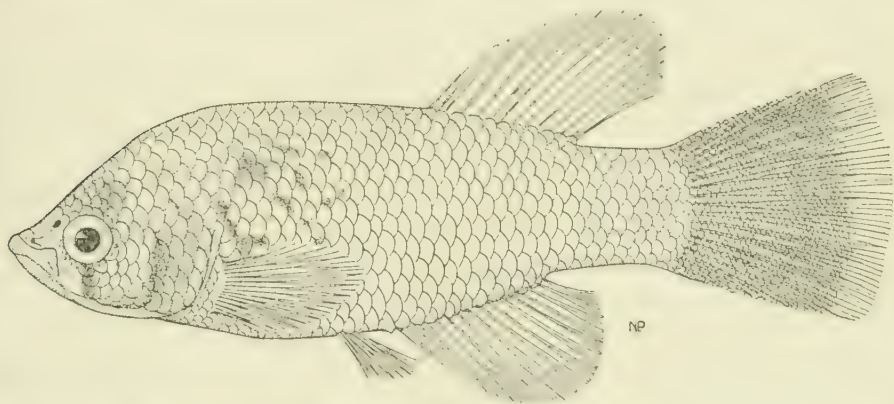


FIGURE 10.—*Austrofundulus transilis limnaeus*, new subspecies: Holotype (U.M.M.Z. No. 141916), 61 mm. in standard length. Drawn by Mrs. Nancy Patton.

Genus AUSTROFUNDULUS Myers

Austrofundulus MYERS, Proc. Biol. Soc. Washington, vol. 45, p. 160, 1932. (Genotype, *Austrofundulus transilis* Myers.)

AUSTROFUNDULUS TRANSILIS TRANSILIS Myers

Austrofundulus transilis MYERS, Proc. Biol. Soc. Washington, vol. 45, p. 160, 1932 (Orinoco drainage of Estado de Guárico in ponds, Venezuela).

U.S.N.M. No. 92191, holotype of *A. transilis* Myers.

AUSTROFUNDULUS TRANSILIS LIMNAEUS, new subspecies

FIGURE 10

Austrofundulus transilis MYERS, Stanford Univ. Bull., vol. 2, No. 4, p. 110, figs. 13, 14, 1942 (15 km. west of San Félix, Estado de Falcón, Venezuela).

Holotype.—U.M.M.Z. No. 141916, 61 mm. in standard length, collected by F. F. Bond (Field Coll. No. 86) 15 km. west of San Félix,

which is at western border of Estado de Falcón, Venezuela, March 21, 1938. [In lower Río Cocuiza.]

Paratypes.—U.M.M.Z. No. 141917, 32 specimens, 38.5 to 73 mm., taken along with the holotype and bearing same data.

In addition, I have examined two specimens reported upon by Dr. De Beaufort as *A. transilis* from Pozo del Arroyo de Aparó, El Cardón, Goajira, that I refer to this species.

TABLE 10.—*Counts and measurements made on species of Austrofundulus. (All measurements are expressed in hundredths of the standard length.)*

Characters	Species						
	<i>transilis</i>	<i>limnaeus</i>			<i>stagnalis</i>		
	Holo-type	Holo-type	Para-type	Para-type	Holo-type	Para-type	Para-type
Standard length in millimeters.....	40.0	61.0	45.5	45.0	31.5	32.6	32.5
Length of head.....	33.2	31.2	36.5	39.5	36.2	37.7	37.5
Greatest depth of body.....	32.0	36.1	32.0	35.6	29.5	29.2	28.9
Length of snout.....	9.50	9.02	7.90	9.55	11.1	10.4	11.1
Diameter of eye.....	9.75	7.54	10.3	9.11	8.57	8.60	8.30
Postorbital length of head.....	17.0	17.9	20.7	18.9	21.9	22.1	23.1
Width of fleshy interorbital space.....	14.3	13.9	12.7	13.6	14.6	15.0	15.7
Length from base of last anal ray to midcaudal fin base.....	23.8	23.1	23.1	22.5	21.3	20.3	20.0
Least depth of caudal peduncle.....	16.7	17.2	16.0	17.8	17.8	15.3	15.4
Greatest width of head.....	20.0	20.5	22.6	21.1	23.8	23.3	22.8
Depth of head at occiput.....	25.0	26.2	23.1	22.2	26.1	25.2	26.1
Length of upper lip.....	9.50	9.02	9.22	8.22	11.1	11.0	11.4
Greatest width of upper lip.....	2.50	1.97	2.42	1.78	3.17	3.68	3.69
Snout to dorsal origin.....	68.2	67.4	69.2	68.9	68.6	69.0	66.8
Snout to anal origin.....	60.2	60.6	63.7	60.7	61.9	62.9	63.7
Snout to pectoral insertion.....	32.8	32.8	35.2	36.5	36.8	37.7	36.9
Snout to pelvic insertion.....	53.8	51.6	57.2	52.6	53.6	54.6	52.3
Length of longest fin ray of: dorsal.....	20.0	23.3	19.2	22.2	24.8	25.6	26.8
anal.....	17.5	19.0	24.6	21.1	28.6	28.2	29.8
pectoral.....	15.0	23.0	23.1	22.2	23.8	25.6	24.9
pelvic.....	11.3	12.3	13.2	12.5	12.7	13.8	13.2
Length of depressed dorsal fin.....	31.5	37.7	33.2	33.0	36.5	36.8	40.6
Length of depressed anal fin.....	30.8	-----	33.0	35.6	40.0	41.4	41.8
Length of base of dorsal fin.....	18.8	23.4	18.7	18.9	21.3	19.3	21.5
Length of base of anal fin.....	20.0	23.4	17.2	21.1	20.0	22.7	21.5
Dorsal rays (counting all rays).....	14	14	15	14	14	14	14
Anal rays (counting all rays).....	16	16	16	18	17	17	17
Pectoral rays (counting all rays).....	16-16	15-15	16-16	—18	17-17	15-16	16-15
Pelvic rays (counting all rays).....	8-8	7-7	8-8	8-8	8-8	8-8	8-8
Gill rakers on first arch.....	2+13	-----	3+15	3+14	-----	3+12	3+13
Scale rows from head to midcaudal fin base.....	32	30	32	32	31	33	32
Number of scales in a row from origin of anal fin to dorsal fin.....	12	12	13	13	13	12	13
Number of scales in a zigzag row across breast between bases of pectoral fins.....	5	8	10	8	13	11	11
Number of scales between pectoral and pelvic fin bases.....	9	11	10	9	14	13	14
Number of scales in zigzag row around caudal peduncle.....	17	20	19	19	20	18	18

Description.—The description is based on the holotype and paratypes. Detailed measurements and counts are recorded in tables 10 and 11.

Head depressed, body compressed posteriorly, interorbital space flat except on large males that have the top of head including interorbital space swollen and fleshy as shown in drawing (Myers, *l. c.*, fig. 13); profile on females and young nearly straight; tip of lower jaw not quite entering profile when mouth is closed; margin of eye not free; teeth essentially as in *stagnalis*, but inner row of villiform band with the teeth a little larger than others in this band; anterior nostrils tubular, posterior nasal opening a slit above front of eye; cheek and operculum scaled; top of head scaled forward, a little in front of a line between front of orbits; caudal fin scaled from one-half to four-fifths the way out the rays, farther in the largest specimens; scales on breast only a little smaller than on sides; anus immediately in front of anal origin; gill rakers about 3 + 14 or 15; caudal fin with truncate rear margin; middle rays of paired fins longest; usually the sixth from last ray of both dorsal and anal fins longest; pectoral fins usually reach just to pelvic insertions or a little past but not to anus; pelvics reach past anal origin; dorsal and anal fins when depressed reach to base of caudal fin; dorsal origin equidistant between midcaudal fin base and rear of head or a little behind head; anal origin in front of a vertical line through dorsal origin and equidistant between midcaudal fin base and middle of postorbital length of head to rear of head; dorsal origin about over base of second branched ray of anal fin; caudal peduncle longer than deep in females or its length equal to its depth in large males; caudal fin a little longer than eye and postorbital length of head, anal fin of female with distal part of first or second to sixth anal rays hardened and more or less fused into a glandlike pad.

Coloration.—In alcohol, pale tan with dark spots anteriorly on adult males; a dark bar below eye more prominent on males; several very faint small pale grayish spots on dorsal fin almost beyond visibility, none can be seen on anal fin; caudal fin of adult males blackish.

TABLE 11.—Counts made on species of *Austrofundulus*

Species	Total number of fin rays							Number of scales															
	Dorsal				Anal			In a zigzag row across breast between pectoral bases										From pectoral base to pelvic base					
13	14	15	16	16	17	18	5	6	7	8	9	10	11	12	13	14	9	10	11	12	13	14	
<i>transilis</i>		1			1			1										1					
<i>limnaeus</i>	3	11	2	1	10	7				2	5	6	3	1				4	7	4	1		
<i>stagnalis</i>		11	6		1	13	3						1	1	6	4	2				2	4	4

Remarks.—This new subspecies may be distinguished from the other members of the genus by means of the key on page 82. It has longer pectoral fins than *A. transilis transilis* and more numerous scales on its breast, whereas *stagnalis* has more numerous scales on its breast than *limnaeus*.

Named *limnaeus* in reference to its habitat in ponds.

AUSTROFUNDULUS STAGNALIS, new species

FIGURE 11

Austrofundulus transilis (in part) MYERS, Stanford Ichthy. Bull., vol. 2, No. 4, p. 110, 1942 (20 km. south of Lagunillas, Venezuela).

Holotype.—U.M.M.Z. No. 141918, 31.5 mm. in standard length, collected by F. F. Bond (Field Coll. No. 91) about 6 km. north of the Río Misoa and 20 km. south of Lagunillas, Maracaibo Basin, March 23, 1938.

Paratypes.—U.M.M.Z. No. 141919, 103 specimens, 14.5 to 34 mm. in standard length, taken along with the holotype and bearing same data; U.S.N.M. No. 121691, 125 specimens, 9 to 20 mm., collected by Leonard P. Schultz in a roadside pond, tributary to Río Cocuiza, 10 km. west of El Mene, Venezuela.

Description.—The description is based on the holotype and paratypes. Detailed measurements and counts are recorded in tables 10 and 11.

Head depressed, body compressed posteriorly, interorbital flat or nearly so; profile of head straight or with a slight concavity opposite orbits; tip of the lower jaw entering profile when mouth is closed; margin of eye not free; outer row of teeth in both jaws formed by conical teeth, widely spaced and larger than the wide villiform band behind them; anterior nostrils tubular, posterior nasal opening above front of eye; cheek and operculum scaled; top of head scaled to a line between front of eye; on largest specimens the caudal fin is scaled not quite halfway out; scales on breast much smaller and more crowded than on sides; anus immediately in front of anal origin; gill rakers short, about 2 or 3 + 12 or 13; caudal fin truncate; middle rays of pectorals and pelvics longest; about fifth or sixth from last ray of both dorsal and anal fins longest; pectoral fins reach to the anus and pelvic fins reach past anal origin; dorsal and anal fins when depressed reaching a little past base of caudal fin; dorsal origin equidistant between midcaudal fin base and rear of head or to upper edge of gill opening; anal origin in front of a vertical line through dorsal origin and equidistant between midcaudal fin base and posterior edge of preopercle; dorsal origin about over base of second branched ray of anal fin; caudal peduncle a little longer than deep; length of caudal fin about equal to eye and postorbital length of head.

Coloration plain pale brownish; darker above and paler underneath; below eye is a trace of a short indistinct dark bar; dorsal and anal fins with several darkish spots barely visible.

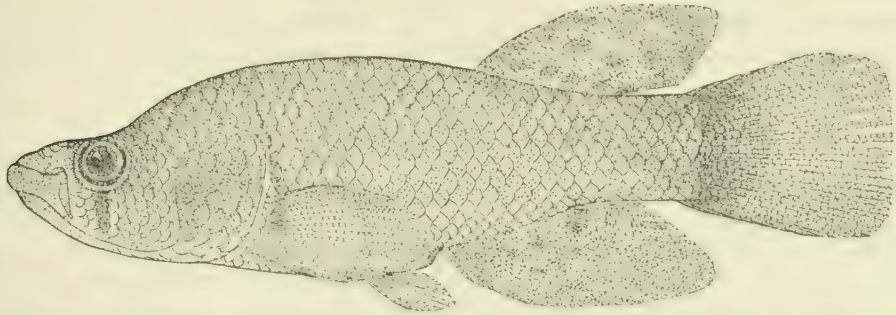


FIGURE 11.—*Austrofundulus stagnalis*, new species: Holotype (U.M.M.Z. No. 141918), 31.5 mm. in standard length. Drawn by Mrs. Aime M. Awl.

Remarks.—This new species may be distinguished from the other two forms in the genus *Austrofundulus* by its wider upper lip, longer pectoral fins, and crowded small scales on the breast. The key on page 82 should enable the reader to identify this species from the other two.

Named *stagnalis* in reference to its habit of living in stagnant ponds or pools.

Genus RIVULUS Poey

Rivulus POEY, Memorias sobre la historia natural de la isla de Cuba, vol. 2, p. 307, 1861. (Genotype, *Rivulus cylindraceus* Poey.)

RIVULUS OBSCURUS Garman

Rivulus obscurus GARMAN, Mem. Mus. Comp. Zool., vol. 19, p. 140, 1895 (Lake Hyanuary).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Río Apure, Venezuela).

It is probable that Pellegrin's record for the Apure River actually is for another species and his material should be restudied.

RIVULUS HARTII (Boulenger)

Haplochilus hartii BOULENGER, Ann. Mag. Nat. Hist., ser. 6, vol. 6, p. 190, 1890 (Trinidad).—REGAN (in part), Proc. Zool. Soc. London, 1906, pt. 1, p. 389, pl. 21, fig. 2 (Trinidad; Venezuela).

Dr. William Beebe kindly turned over to me a specimen 31.5 mm. in standard length collected by him May 23, 1942, at Caripito, that I tentatively identify with this species. Its caudal fin is more pointed than usual in *Rivulus*.

The two specimens before me (U.S.N.M. No. 94308) from Pitch Lake, Trinidad, have 6 branched dorsal rays, 11 branched anal rays,

and 13-13 pectoral rays. Regan's figure (*l.c.* pl. 21, fig. 2), probably of the type of *hartii*, also shows 13 pectoral rays. Another important character is the presence of only 6 branched dorsal rays in *hartii*. Among the material of *Rivulus* available from Venezuela I fail to find specimens that consistently agree with *hartii*, although collections made in British Guiana and Brazil appear to agree fairly well with my material from Trinidad, the type locality of *hartii*.

RIVULUS HOLMIAE Eigenmann

Rivulus holmiae EIGENMANN, Ann. Carnegie Mus., vol. 6, p. 50, 1909 (Holmia, British Guiana).

Rivulus hartii MYERS, Copeia, 1924, No. 135, p. 96 (Margarita Island, Venezuela); Stanford Ichthyol. Bull., vol. 1, No. 5, p. 171, 1940 (Margarita Island).—DE BEAUFORT, Freshwater fishes from the Leeward group, Venezuela and eastern Colombia. Studies on the fauna of Curaçao, Aruba, Bonaire, and the Venezuelan islands, vol. 2, p. 110, 1940 (Margarita Island).

U.S.N.M. No. 94150, 1 specimen, 71 mm. in standard length, El Valle, Isla de Margarita, Austin H. Clark.

U.M.M.Z. Collection 142, 75 specimens, 14 to 73 mm., Río Porlamar at El Valle, Isla de Margarita, F. F. Bond (lent by Dr. Carl L. Hubbs), April 1, 1939.

Upon studying a series of specimens from El Valle, Isla de Margarita, Venezuela, and comparing them with a paratype of *Rivulus*

TABLE 12.—Measurements made on certain species of *Rivulus* expressed in hundredths of the standard length

Characters	<i>hartii</i>			<i>holmiae</i>	<i>bondi</i>		
	Caripito N.Y.Z.S. No. 30239	Trinidad U.S.N.M. No. 94308		Margarita Island U.S.N.M. No. 94150	Caripito N.Y.Z.S. No. 30015 Paratype	U.M.M.Z. Holotype	U.M.M.Z. Paratype
Standard length.....	31.5	36.0	30.5	71.0	66.0	40.2	50.5
Length of head.....	27.0	27.8	27.8	26.2	26.2	29.2	27.1
Greatest depth.....	20.0	22.8	19.7	22.5	20.4	19.9	19.6
Length of snout.....	6.35	7.50	8.20	8.04	8.33	8.70	8.32
Diameter of eye.....	8.26	9.44	9.84	7.04	6.52	7.96	7.92
Postorbital length of head.....	14.0	12.8	13.8	12.7	12.9	14.2	13.1
Interorbital space.....	12.7	13.9	14.1	14.1	12.9	11.2	12.5
Length of caudal peduncle.....	21.2	20.0	20.0	19.7	18.9	16.2	16.4
Least depth of caudal peduncle.....	13.3	14.4	13.1	15.5	13.5	12.9	12.9
Greatest width of head.....		18.1	19.0	20.3	19.9	19.7	17.8
Snout to dorsal origin.....	81.0	77.8	80.3	72.5	73.0	77.4	77.2
Snout to anal origin.....	66.7	61.4	63.6	57.0	61.5	63.4	61.0
Snout to pectoral insertion.....	26.7	26.7	28.5	26.8	26.0	29.6	27.7
Snout to pelvic insertion.....	54.0	51.4	55.4	48.0	51.5	51.2	51.5
Length of longest dorsal ray.....	13.7	16.7	15.1	14.4	14.1	16.7	17.2
Length of longest anal ray.....	15.9	16.7	15.4	15.1	13.3	15.2	17.2
Length of longest pectoral ray.....	21.1	17.8	17.0	18.3	17.0	18.9	17.6
Length of longest pelvic ray.....	9.52	8.05	9.18	10.6	7.72	9.95	10.3
Length of longest caudal ray.....	27.0	25.3	25.6	23.2	24.2	26.6	25.0
Length of depressed dorsal fin.....	20.3	21.9	21.0	24.7	22.7	23.1	24.2
Length of depressed anal fin.....	31.8	32.0	28.8	36.6	31.8	32.3	36.6
Length of base of dorsal fin.....	6.67	8.33	8.85	12.4	10.6	10.5	10.5
Length of base of anal fin.....	19.4	20.3	19.7	25.9	23.6	22.4	23.7

TABLE 13.—*Counts made on certain species of Rivulus*

Species	Branched fin rays										Pectoral fin rays										Number of scales										
	Dorsal					Anal					Dorsal origin to anal fin										Zigzag row between bases of pectoral fins across breast										
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
<i>holmiae</i> ¹				17					1	15	3																				
<i>hartii</i> ²	1	13					6	2	4	2																					
<i>bondi</i> ³		3	20					1	3	14	5																				
<i>dorni</i> ⁴			1	2		2	1																								
<i>elegans</i> ⁵			1						1																						
<i>beniensis</i> ⁶	2				2																										
<i>stagnatus</i> ⁷		1					1																								

Species	Number of scales from head to midcaudal fin base																			Number of scales in front of dorsal fin to occiput																		
	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60							
<i>holmiae</i> ¹																																						
<i>hartii</i> ²						3	4	1																														
<i>bondi</i> ³									3	8	2	1																										
<i>dorni</i> ⁴	1	2																																				
<i>elegans</i> ⁵										1																												
<i>beniensis</i> ⁶			2																																			
<i>stagnatus</i> ⁷																	1																					

¹ U.S.N.M. No. 66302 and Margarita Island.

² U.S.N.M. Nos. 88282, 94308, 88295, 130644.

³ From Caripito.

⁴ U.S.N.M. No. 92966.

⁵ U.S.N.M. No. 117622.

⁶ U.S.N.M. No. 120432.

⁷ U.S.N.M. No. 66303.

holmiae Eigenmann (U.S.N.M. No. 66302) and finding no significant differences, I decided to identify the specimens, at least tentatively, with *holmiae* from British Guiana. This leaves a problem concerning the distribution of *holmiae* to be studied when adequate series of this form are collected in the intervening territory, but until material is available it is preferable to leave the form on Margarita Island unnamed.

My chief basis for referring the specimens from the Isla de Margarita to *holmiae* was the fin-ray and scale counts and coloration which appear to agree in alcohol. It should be noted that in recording the dorsal and anal rays I have included only the branched rays in table 12.

Dr. George S. Myers (1924, p. 96, and 1940, p. 171) has reported *Rivulus hartii* from Margarita Island, Venezuela, based on U.S.N.M. No. 94150, but I find that this specimen, as well as all the others from that island that I have studied, has 8 branched dorsal rays instead of 6 as in *hartii* from Trinidad; thus I refer Myers's records to the synonymy of *holmiae*.

RIVULUS BONDI, new species

FIGURE 12

? *Haplochilus harti* REGAN (in part), Proc. Zool. Soc. London, 1906, pt. 1, p. 389 (Venezuela).

Rivulus harti REGAN (in part), Ann. Mag. Nat. Hist., ser. 8, vol. 10, p. 501, 1912 (Venezuela).—MYERS (in part), Ann. Mag. Nat. Hist., ser. 9, vol. 19, p. 123, 1927 (Venezuela to Columbia).

? *Rivulus micropus* (non Steindachner) GÜNTHER, Catalogue of the fishes in the British Museum, vol. 6, p. 328, 1866 (Venezuela).—EIGENMANN AND ALLEN (in part), Fishes of western South America, p. 346, 1942 (Venezuela).

Holotype.—U.M.M.Z. No. 141914, a female, 40.2 mm. in standard length, collected at La Florida, Caracas, Venezuela, in a quebrada caño tributary to the Río Guaire, by F. F. Bond, January 10, 1938.

Paratypes.—U.M.M.Z. No. 141915, 126 specimens, 14 to 59 mm., taken along with the holotype and bearing same data.

U.M.M.Z. No. 141929, 9 specimens, 20.5 to 36.5 mm., from a lagoon 3 km. northwest of Petare, Venezuela (Río Guaire system), collected by F. F. Bond, January 15, 1939.

Dr. William Beebe kindly turned over to me for report the following specimens collected in Venezuela in 1942:

N.Y.Z.S. No. 30015, 5 specimens, 32.5 to 67 mm., Caripito.

N.Y.Z.S. No. 30234, 1 specimen, 54 mm., East Caripito Creek, near Caripito, March 6.

Description.—The description is based on the holotype and paratypes listed above. Detailed measurements were made and these are recorded in table 12 for the holotype and two paratypes.

The following counts were made, respectively, for the holotype and a

paratype from Caracas: Dorsal rays ii, 7 (ii, 7); anal rays iii, 14 (ii, 15); pectoral rays 16–15 (15–16); pelvic rays i, 6–i, 6 (i, 6–i, 6); scales from upper edge of gill opening to midcaudal fin base 38 (39); scales from dorsal origin to front of anal 9 (9); scales in front of dorsal fin to occiput 27 (28); number of scales in a zigzag row around caudal peduncle 15 (16); scales in a zigzag row across breast between lower edges of base of pectoral fin 9 (10).

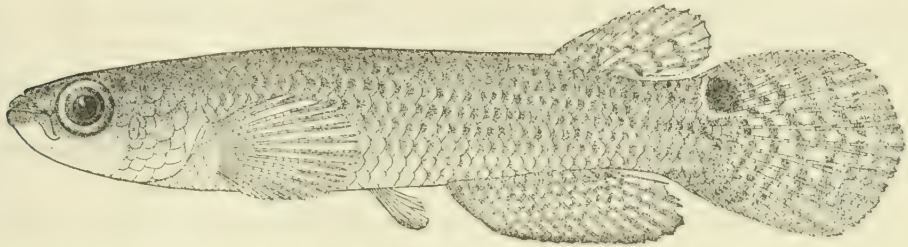


FIGURE 12.—*Rivulus bondi*, new species: Holotype (U.M.M.Z. No. 141914), 40.2 mm. in standard length. Drawn by Mrs. Aime M. Awl.

Head depressed, but body compressed posteriorly, the greatest depth about 5 and head 3.5 in standard length; margin of eye not free; eye equal to snout and about $3\frac{1}{2}$ in the head; interorbital wider than eye and about 2 in the head; rear margin of eye a trifle closer to rear of head than tip of snout; origin of dorsal to midcaudal fin base contained 2.9 times in distance from tip of snout to dorsal origin; origin of anal fin a trifle closer to midcaudal fin base than middle of post-orbital length of head; base of last anal ray under the base of third from last ray of dorsal fin in posterior half of base of dorsal fin; pectoral fins reaching more than halfway to anal origin but not to bases of pelvics; pelvic fins reach just to anal origin; least depth of caudal peduncle contained about 1.3 in length of peduncle from base of last anal ray to midbase of caudal fin; caudal fin rounded; distal margin of anal fin rather straight; pectorals, pelvics, and dorsal with rounded margins; usually fourth from last ray of dorsal and anal fins longest.

Coloration.—The color in alcohol of the holotype consists of a light brownish background with rows of dark brown spots on sides, mostly posteriorly, the row along midaxis most prominent and beginning behind head, the other rows paler forward; each row of black spots corresponds to a row of scales and the dark spot is at center of each scale; dorsal and caudal fins barred, with a black ocellate spot at upper caudal fin base; bases of last two dorsal rays with a pale spot enclosed above by a brownish bar on base of fin; undersides in front of pelvics plain in color; underside of head finely pigmented; dorsal side of head and back dark brownish; lower lip or chin brownish; margin of anal fin and outer edge of pelvic fins blackish; pectorals finely pigmented.

The coloration of the adult males is considerably different from the

females since the males lack the rows of spots on the sides and the ocellate black spot on upper caudal fin base; back and sides blackish brown, gradually becoming paler underneath; sides of body with rows of pale specks corresponding to center of each scale; dorsal and anal fins faintly barred; blackish color of body continuing to end of caudal fin, forming a wide band on middle four-fifths of caudal fin, sharply contrasting with the white dorsal and ventral edges of this fin; pectorals dark; margin of anal and of pelvics black edged; chin and underside of head as in females.

Remarks.—This new species traces down to *Rivulus harti* in the key prepared by Regan (1912, pp. 495–496) but it differs from that species as indicated in the key on page 83 and the counts differ somewhat as indicated in table 13.

Named *bondi*, in honor of Dr. F. F. Bond, who collected this species.

Genus RACHOVIA Myers

Rachovia MYERS, Ann. Mag. Nat. Hist., ser. 9, vol. 19, pp. 116, 119, 1927. (Genotype, *Rivulus brevis* Regan.)

RACHOVIA HUMMELINCKI de Beaufort

Rachovia hummelincki DE BEAUFORT, Studies on the fauna of Curaçao, Aruba, Bonaire, and the Venezuelan Islands, vol. 2, p. 110, pl. Xb, 1940 (Península de Paraguana, Poza de San Antonio, east of Carirubana, Venezuela).

Genus CYPRINODON Lacepède

Cyprinodon LACEPÈDE, Histoire naturelle des poissons, vol. 5, p. 486, fig., 1803. (Genotype, *Cyprinodon variegatus* Lacepède.)

CYPRINODON DEARBORNI Meek

GUAJACON

Cyprinodon dearborni MEEK, Publ. Field Columbian Mus. (Zool.), vol. 7, No. 7, p. 208, 1909 (Willemstad, Curaçao, Dutch West Indies).

Cyprinodon cyanostriga AHL, Zool. Anz., vol. 124, p. 58, 1938 (Curaçao, in sea and in strong brackish water).

U.S.N.M. No. 121692, 147 specimens, 11 to 45 mm. in standard length, Salina Santa Rosa, 3 km. north of Maracaibo in a pool with a specific gravity reading of 1.029 and a temperature of 98° F., February 20, 1942.

The following collections were made by Dr. F. F. Bond and were lent for report by Dr. Carl L. Hubbs, University of Michigan.

1 specimen, 13.2 mm., from cemetery, Puerto Cabello, January 26, 1938.

73 specimens, 8.2 to 27.4 mm., saline lagoon 5 km. west of Cumaná, March 25, 1939.

1 specimen, 12 mm., coastal lagoon 15 km. north of Maracaibo, April 6, 1938.

63 specimens, 10 to 27.5 mm., lagoons, Tucacas, Estado de Falcón, 60 km. northwest of Puerto Cabello, January 29, 1939.

2 specimens, 24 and 26 mm., Laguna del Río Capatárida, 5 km. north of Capatárida, March 4, 1938.

50 specimens, 12.5 to 27.5 mm., tidal pools, Puerto Cabello, January 26, 1938.

280 specimens, 10.5 to 27.2 mm., lagoon 3 km. northwest of Barcelona, March 22, 1939.

453 specimens, 10.2 to 28 mm., bajo seco east side of Puerto Cabello, January 26, 1938.

HUBBSICHTHYS, new genus

Genotype: Hubbsichthys laurae, new species.

This new genus of Fundulinae is characterized by the free orbital margin; eye diameter a little greater than the snout; interorbital space flat, much wider than eye diameter; premaxillaries protractile; lower jaw oblique; maxillary and anterior edge of the preorbital oblique, not quite vertical, no angular pocket formed along front of preorbital; fine conical teeth in upper jaw in two rows anteriorly, but laterally forming a patch that ends in a sharp angular point posteriorly; teeth in lower jaw in two rows; dorsal origin in advance of that of anal fin; dorsal origin equidistant between midcaudal fin base and front margin of eye; anal origin very slightly closer to rear margin of eye than midcaudal fin base; caudal fin rounded; gill rakers about 10 on lower part of first gill arch, short; gill membranes extending forward to under pupil where they join forming a free fold; the row of scales along middle of side much larger than those above and below; base of caudal fin scaled.

Remarks.—The genus may be recognized from the American genera related to *Rivulus* as discussed by Myers (1927) by having a free orbital margin and from other genera by a combination of characters, as dorsal origin in advance of anal origin; an enlarged row of scales along midsides, with smaller scales in the rows above and below; cleft of mouth evenly curved and oblique; preorbital edge oblique without angular pocket at upper edge; flat interorbital space, and small conical teeth in two rows in both jaws. From *Chriopeoides* Fowler (Notulae Naturae No. 35, p. 4, 1939, Jamaica) with which this new genus is related it differs by having the upper edges of the preorbital a little farther forward than the lower corner, so that the preorbital edge slants forward, while in *Chriopeoides* the slant is in the opposite direction; scales on breast in front of pelvic bases smaller than on sides, the middle row irregular, with about 12 scales, while in *Chriopeoides* the midventral row is very regular on breast, as large as scales on sides, and number 8 scales. There are 12 scales in a zigzag row around caudal peduncle instead of 14 as in *Hubbsichthys*. Interorbital space very slightly convex in *Chriopeoides* but flat and on level of upper rim of orbit in *Hubbsichthys*.

One of the paratypes of *Chriopeoides pengelleyi* Fowler, A.N.S.P. No. 68633, was kindly lent for examination by Henry W. Fowler, of the Academy of Natural Sciences of Philadelphia.

Named *Hubbsichthys* in honor of Dr. Carl L. Hubbs, of the Scripps Institution of Oceanography, La Jolla, Calif., who has contributed much knowledge concerning the cyprinodont fishes.

HUBBSICHTHYS LAURAE, new species

FIGURE 13

Mollienisia caucana GABALDON (in part), Journ. Parasit., vol. 21, No. 4, pp. 311-312, 1935 (Pampán, Trujillo, Venezuela).

Holotype.—U.S.N.M. No. 120999, a specimen, 14 mm. in standard length, collected near Pampán, Estado de Trujillo, Venezuela, by Dr. Arnoldo Gabaldon, in 1935 and probably in Río Motatán drainage.

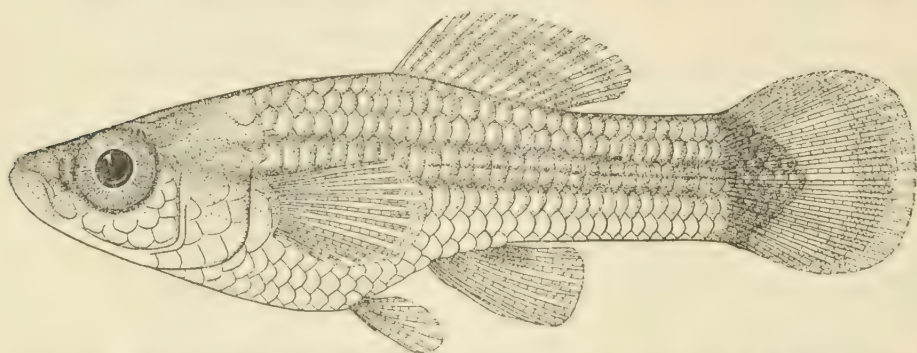


FIGURE 13.—*Hubbsichthys lauræ*, new genus and species: Holotype (U.S.N.M. No. 120999), 14 mm. in standard length. Drawn by Mrs. Aime M. Awl.

Description.—Certain detailed measurements and counts were made on the holotype and these data are recorded in table 14.

In addition to the characters recorded in the generic description, in the key, and in the table, the following is given: Eye about 1.2 or 1.3 in the flat interorbital space; head 3, depth 3.5, in standard length; pectoral fins not quite reaching to opposite anal origin but past middle of pelvics, the tips of latter extending a trifle past anal origin; caudal, anal, and pectoral fins with posterior margins rounded; the second ray of pelvic is longest; caudal fin scaled about one-third to two-fifths out from its base.

Coloration.—General color in alcohol brownish, with a darker band along midsides, somewhat broken by pale centers of scales; anal with a black spot near middle of fin on posterior rays.

Remarks.—This new species may be distinguished from all other related forms of cyprinodont fishes by means of the key. It differs in regard to free margin of eye, forward slant of anterior edge of preorbital, crowded scales on breast, origin of dorsal in front of that of anal, and in coloration.

Named *lauræ*, in honor of Laura Clark Hubbs (Mrs. Carl L. Hubbs).

TABLE 14.—*Counts and measurements made on Hubbsichthys laurac*

[All measurements expressed in hundredths of the standard length]

Characters	U.S.N.M. No. 120999 Holotype
Standard length in millimeters.....	14.0
Length of head.....	33.6
Postorbital length of head.....	13.6
Greatest depth of body.....	30.0
Length of snout.....	8.57
Diameter of eye.....	12.1
Interorbital space at middle of orbits.....	15.7
Length of caudal peduncle.....	33.6
Least depth of caudal peduncle.....	15.7
Greatest width of head.....	20.7
Distance from snout to dorsal origin.....	52.8
Snout to anal origin.....	57.2
Snout to pectoral insertion.....	32.9
Snout to pelvic insertion.....	47.2
Length of longest ray of dorsal fin.....	12.1
Length of longest ray of anal fin.....	15.7
Length of longest ray of pectoral fin.....	20.7
Length of longest ray of pelvic fin.....	11.4
Length of longest ray of caudal fin.....	25.0
Length of depressed dorsal fin.....	30.0
Length of depressed anal fin.....	21.4
Length of base of dorsal fin.....	24.3
Length of base of anal fin.....	8.57
Scales from head to midcaudal fin base.....	32
Scales from dorsal origin to anal origin.....	8
Scales in a zigzag row around caudal peduncle.....	14
Scales in front of dorsal plus enlarged ones on head.....	9+3 or 4
Dorsal rays.....	i, 12
Anal rays.....	iii, 7
Pectoral rays.....	15-15
Pelvic rays.....	7-7

Family POECILIIDAE

As Dr. Carl L. Hubbs, of the Scripps Institution of Oceanography had begun work on the Poeciliidae of Venezuela collected by Dr. F. F. Bond, he wished to work up the national collections of this family. Since his studies are still in progress I have omitted this material, along with some collected by me in Venezuela.

Genus POECILIA Bloch and Schneider

Poecilia BLOCH AND SCHNEIDER, *Systema ichthyologiae*, p. 452, 1801. (Genotype, *Poecilia vivipara* Bloch and Schneider.)

POECILIA VIVIPARA Bloch and Schneider

Poecilia vivipara BLOCH AND SCHNEIDER, *Systema ichthyologiae*, p. 452, 1801 (Surinam).—ERNST, *Estudios sobre la flora y fauna de Venezuela*, p. 282, 1877 (creeks near Caracas).—REGAN, *Proc. Zool. Soc. London*, 1913, p. 1006, fig. 173c (Venezuela and Leeward Islands to Río La Plata).—DE BEAUFORT, *Studies on the fauna of Curaçao, Aruba, Bonaire, and the Venezuelan Islands*, vol. 2, p. 111, 1940 (Peninsula de Paraguana, Estanque de Moruy, Estanque de Santa Fé, Estanque de Santa Ana, Venezuela).

The following collection was lent by Dr. William Beebe:

20 specimens, 17 to 27 mm., from Caripito, 1942.

Genus **LEBISTES** Filippi

Lebistes FILIPPI, Arch. Zool. Anat. Fisiol., vol. 1, p. 69, 1861. (Genotype, *Poecilia reticulata* Peters.)

LEBISTES RETICULATUS (Peters)

Poecilia reticulata PETERS, Monatsb. Akad. Wiss. Berlin, 1859, p. 412 1860 (Caracas in Río Guaire).—GARMAN, Mem. Mus. Comp. Zool., vol. 19, No. 1, p. 62, 1895 (Venezuela).

Girardinus reticulatus GÜNTHER, Catalogue of the fishes in the British Museum, vol. 6, p. 353, 1866 (Caracas, Venezuela).—EIGENMANN AND EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 65, 1891 (Caracas).

Girardinus guppyi GÜNTHER, Catalogue of the fishes in the British Museum, vol. 6, p. 353, 1866 (Venezuela).—EIGENMANN AND EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 65, 1891 (Venezuela).

Lebistes reticulatus REGAN, Proc. Zool. Soc. London, 1913, p. 1008, fig. 173 D, (Venezuela).—EIGENMANN, Indiana Univ. Studies, vol. 7, No. 44, p. 13, 1920 (Maracay; Río Castaño; Isla del Buro; Río Bue; all Lake Valencia basin).—PEARSE, Univ. Wisconsin Studies, No. 1, p. 22, 1920 (Lake Valencia at Maracay and Isla del Buro).—DE BEAUFORT, Studies on the fauna of Curaçao, Aruba, Bonaire, and the Venezuelan Islands, vol. 2, p. 111, 1940 (Margarita Island).

U.S.N.M. No. 121689, 290 specimens, Río Valle, south of Caracas, Venezuela, L. P. Schultz, G. Zuloaga, William Phelps, Jr., and R. Sherman, May 12, 1942.
Two specimens, 15.5 and 18.5 mm., William Beebe, Caripito, 1942.

Genus **MOLLIENISIA** LeSueur

Mollienisia LESUEUR, Journ. Acad. Nat. Sci. Philadelphia, vol. 2, p. 3, 1821. (Genotype, *Mollienisia latipinna* LeSueur.)

Allopoecilia HUBBS, Misc. Publ. Mus. Zool. Univ. Michigan, No. 13, pp. 11, 13, pl. 4, fig. 6 (gonopodium), 1924. (Genotype, *Girardinus caucanus* Steindachner.)

MOLLIENISIA CAUCANA (Steindachner)

Girardinus caucanus STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 42, p. 87, pl. 6, figs. 4, 5, 1880 (Río Cauca).

Allopoecilia caucana MYERS, Copeia, 1932, No. 3, p. 138 (? Maracaibo Basin).

Mollienisia caucana GABALDON (in part), Journ. Parasit., vol. 21, No. 4, pp. 311–312, 1935 (Pampán, Trujillo, Venezuela).

U.S.N.M. No. 121677, 33 specimens, 19 to 33 mm., from Río Motatán, 4 km. above Motatán, March 25, 1942.

U.S.N.M. No. 121681, 34 specimens, 11 to 26 mm., Río Motatán, 8 km. below Motatán, March 24, 1942.

U.S.N.M. No. 121679, 33 specimens, 14 to 28 mm., Río San Pedro at bridge, Motatán system, March 20, 1942.

U.S.N.M. No. 121686, 169 specimens, 8 to 32.5 mm., Río San Juan near bridge, Motatán system, March 17 and 20, 1942.

U.S.N.M. No. 121682, 11 specimens, 11.5 to 25.5 mm., Río Jimelles, 12 km. east of Motatán, Motatán system, March 24, 1942.

U.S.N.M. No. 121685, 191 specimens, 12 to 35 mm., Río Chama at Estanques, Estado de Mérida, April 3, 1942.

U.S.N.M. No. 121680, 16 specimens, 13 to 29 mm., Río Barregas, tributary Río Chama just below Egido, Estado de Mérida, March 29, 1942.

U.S.N.M. No. 121678, 5 specimens, 17 to 33 mm., Río Chama, 10 km. below Lagunillas, Estado de Mérida, March 30, 1942.

U.S.N.M. No. 121676, 1 specimen, Río Palmar at bridge, 70 km. southwest of Maracaibo, March 6, 1942.

U.S.N.M. No. 109112, 2 specimens, Pampán, Estado de Trujillo, Venezuela, Dr. Arnoldo Gabaldon, April 18, 1935. One specimen from this lot is the holotype of *Hubbsichthys lauræ* herein described.

U.S.N.M. No. 86264, 4 specimens, 28 to 43 mm., Valera, Estado de Trujillo, Venezuela, H. Pittier, 1923.

U.S.N.M. No. 86263, 2 specimens, 23 and 24 mm., Valera, Estado de Trujillo, Venezuela, H. Pittier, 1923.

MOLLIENISIA SPHENOPS VANDEPOLLI (Van Lidth de Jeude)

Pocilia vandepolli VAN LIDTH DE JEUDE, Notes Leyden Mus., vol. 9, p. 137, 1887 (ref. copied).

Mollienesia sphenops REGAN, Proc. Zool. Soc. London, 1913, p. 1012, fig. 173 F (Venezuela).—MEEK AND HILDEBRAND, Publ. Field Columbian Mus. (Zool.), vol. 10, No. 15, p. 327, fig. 10, 1916 (Venezuela).

U.S.N.M. No. 121687, 27 specimens, brackish caño at Los Monitos, Río Limón system, March 11, 1942.

U.S.N.M. No. 121688, 10 specimens, Lago de Maracaibo at Yacht Club, Maracaibo, February 27, 1942.

U.S.N.M. No. 121690, 1,328 specimens, 9 to 70 mm., Salina Santa Rosa, 3 km. north of Maracaibo, specific gravity 1.029, temperature 98° F., February 20, 1942.

Order BERYCOIDEA

Family HOLOCENTHRIDAE: Squirrelfishes

Genus HOLOCENTRUS Scopoli

Holocenthrus SCOPOLI, Introductio historiam naturalem, p. 499, 1777. (Misprint for *Holocentrus* after Gronow's *Holocentrus maxilla*.)

HOLOCENTRUS ASCENSIONIS (Osbeck)

SQUIRRELFISH, MATEJUELO, CANDIL O CARAJUELO

Perca ascensionis OSBECK, Reise nach Ostindien und China, p. 388, 1765 (ref. copied) (Ascension Island).

Holocentrus ascensionis RÖHL, Fauna descriptiva de Venezuela, p. 393, fig. 202, 1942 (coast of Venezuela).

Order SOLENICHTHYOIDEA

Family FISTULARIIDAE: Trumpetfishes or Cornetfishes

Genus FISTULARIA Linnaeus

Fistularia LINNAEUS, Systema naturae, ed. 10, p. 312, 1758. (Genotype, *Fistularia tabacaria* Linnaeus.)

FISTULARIA TABACARIA Linnaeus

TRUMPETFISH; TROMPETERO o CORNETA

Fistularia tabacaria LINNEAUS, Systema naturae, ed. 10, p. 312, 1758.—RÖHL, Fauna descriptiva de Venezuela, p. 389, fig. 198, 1942 (coast of Venezuela).

Family SYNGNATHIDAE: Pipefishes; Seahorses

Earl S. Herald (1942) has prepared a key to the pipefishes of the western Atlantic which includes all the known American species. I have prepared the following key for the identification of the pipefishes reported from Venezuela, but as more collecting is done several additional species should be taken:

- 1a. Tail prehensile, usually more or less in a curled condition; caudal fin absent; head at nearly right angles to body (*Hippocampus*).¹⁶
- 1b. Tail not prehensile; caudal fin present; head not at right angles to body but in same general axis.
 - 2a. The keel along the middle of the side of the trunk turns downward over the anus and without interruption continues posteriorly as the lower lateral keel on the tail region; dorsal and anal fins present; dorsal fin rays 38 to 44; rings on body about 19 or 20+23 to 27; pectoral fin rays about 19 or 20; dorsal origin in second or third ring in front of ring containing anal fin base.-----**Oostethus lineatus** (Kaup)
 - 2b. The medial keel along side of the trunk not continuous with the lower lateral keel on tail.
 - 3a. Keel along middle of side of trunk turned upward over anus and without interruption continuing posteriorly as upper lateral keel on tail region; dorsal fin present; anal fin absent; dorsal fin rays usually 35 to 37; rings on body 14+35 to 38; pectoral fin rays 13 or 14; dorsal origin usually in body ring that contains anus.

Pseudophallus mindii (Meek and Hildebrand)
 - 3b. Keel along middle of side of trunk interrupted or discontinuous over anal region, then beginning in same body ring but continuing as upper lateral keel on tail region; dorsal and anal fins present.
 - 4a. Tail rings 30 to 38; brood pouch covering 11 to 20 tail rings; rings on body 16 to 18+30 to 35; dorsal rays 27 to 33; pectoral fin rays 13 or 14; dorsal origin usually in first trunk ring in front of the one that contains anus.
 - 5a. Adult females flat-bellied and without vertical pale body stripes on middle of trunk rings.-----**Syngnathus rousseau** Kaup
 - 5b. Adult females V-bellied and with vertical pale stripe in center of each trunk ring, striping usually present upon tail.

Syngnathus pelagicus Linnaeus
 - 4b. Tail rings 39 to 43; brood pouch covering 22 to 25 tail rings.

Syngnathus fistulatus Peters

Genus OOSTETHUS Hubbs

Oostethus HUBBS, Occ. Papers Mus. Zool. Univ. Michigan, No. 199, p. 3, 1929.
(Genotype, *Doryichthys lineatus* Kaup.)

¹⁶ *Hippocampus punctulatus* is recorded by Röhl (1942) from the coast of Venezuela but even with the aid of Ginsburg's review of the genus (Proc. U. S. Nat. Mus., vol. 83, pp. 497-594, figs. 54-71, 1937) I do not know what species he actually had. The common name in Venezuela is caballito de mar.

In 1943 (U. S. Nat. Mus. Bull. 180, p. 73) I included this genus in the synonymy of *Doryichthys* Kaup but upon further consideration I am inclined to recognize it as a distinct genus.

OOSTETHUS LINEATUS (Kaup)

Doryichthys lineatus KAUP, Catalogue of the lophobranchiate fish in the collection of the British Museum, p. 59, 1856 ("Bahía, Mexico and Guadaloupe").

3 specimens, 139 to 159 mm., Río Sanchón, 5 km. west of Tavorda, F. F. Bond, January 26, 1938.

5 specimens, 104 to 165 mm., from Río Cumboto, near mouth, 2 km. northwest of Ocumare, F. F. Bond, May 5, 1939.

1 specimen, 112 mm., from Río Cumboto, near Ocumare, F. F. Bond, January 5, 1938.

Genus PSEUDOPHALLUS Herald

Pseudophallus HERALD, Allan Hancock Pacific Expedition, vol. 9, No. 3, p. 51, 1940. (Genotype, *Siphostoma starksi* Jordan and Culver.)

PSEUDOPHALLUS MINDII (Meek and Hildebrand)

Syngnathus mindii MEEK AND HILDEBRAND, The marine fishes of Panama, vol. 1, p. 261, pl. 18, fig. 2, 1923 (creek near Mindi, Canal Zone).

1 specimen, 95 mm., standard length, from Río Sanchón, 5 km. west of Tavorda, F. F. Bond, January 26, 1938.

2 specimens, 112 and 113.5 mm., from Río Cumboto, near mouth, 2 km. northwest of Ocumare, F. F. Bond, May 5, 1939.

1 specimen, 100 mm. but with regenerated caudal region, Río Cumboto, near Ocumare, F. F. Bond, January 5, 1938.

The following counts were made on the above listed specimens: Dorsal fin rays 37 in three counts, 39 in one; pectoral rays 13 in one and 14 in three counts; body rings on trunk 14 in all four specimens, and tail rings 35 in two, 36 in one, and only 28 body rings left in the injured specimen; caudal fin had 10 rays in one count.

The coloration consists of dark brown upper side, sharply contrasting with a pale grayish band along the dorsal side from snout to tail; ventral side pale; caudal fin bordered with pale; dark brown streak from lower jaw through eye to pectoral fin base; actual tip of lower jaw pale and forming part of pale band on dorsal surface of head.

Genus SYNGNATHUS Linnaeus

Syngnathus LINNAEUS, Systema naturae, ed. 10, p. 336, 1758. (Genotype, *Syngnathus acus* Linnaeus.)

SYNGNATHUS ROSSEAU Kaup

Syngnathus rosseau KAUP, Catalogue of lophobranchiate fish in the collection of the British Museum, p. 40, 1856 (Martinique).—HERALD, Stanford Ichthyol. Bull., vol. 2, No. 4, pp. 130, 133, 1942 (Venezuela).

U.S.N.M. No. 123162, 4 specimens, 114 to 147 mm., Point Macolla, U. S. S. Niagara, April 19, 1925.

U.S.N.M. No. 123163, 1 specimen, 102 mm., Cape San Román, U. S. S. Niagara, April 2, 1925.

SYNGNATHUS PELAGICUS Linnaeus

Syngnathus pelagicus LINNAEUS, Systema naturae, ed. 10, p. 337, 1758.

U.S.N.M. No. 123164, 1 specimen, 183 mm., Point Macolla, U. S. S. Niagara, April 19, 1925.

SYNGNATHUS FISTULATUS Peters

Syngnathus fistulatus PETERS, Monatsb. Akad. Wiss. Berlin, 1868, p. 456 (Puerto Cabello [undoubtedly Venezuela]).

Order PERCOMORPHOIDEA

Suborder PERCESOCES

Family ATHERINIDAE: Silversides; Pescados del rey, o Pejerreres

This family of world-wide distribution has only four species so far known from Venezuelan waters. They may be distinguished by means of the following key:

- 1a. Four glandlike depressions on dorsal surface of snout; anus far forward, equidistant or nearer pelvic bases than anal fin origin; air bladder and body cavity not reaching anywhere near to opposite anal fin origin; first dorsal origin notably in front of anal origin; scaly sheath along base of anal fin consisting of a few scales anteriorly; margins of scales with entire edges; ascending premaxillary process a narrow spinelike projection; dorsal rays IV or V—I, i, 7 or I, i, 8; anal rays I, i, 14; scales about 44.

Adenops analis Schultz
- 1b. No glandlike depressions on dorsal surface of snout as in *Adenops*; anus just in front of anal origin or much closer to anal origin than to pelvic bases; ascending premaxillary process a wide-based triangular projection; margins of scales entire.
- 2a. Posterior end of body cavity extending to anal origin or well past anal fin origin; belly rounded; no sheath of scales along anal fin base; first dorsal origin over or nearly over anal origin, sometimes over base of first branched anal ray; dorsal rays III or IV—I, i, 5 to I, i, 7; anal rays I, i, 14 to I, i, 19.
- 3a. Scale rows from upper angle of gill opening to midbase of caudal fin 38 to 40-----*Xenomelaniris brasiliensis* (Quoy and Gaimard)
- 3b. Scale rows 41 or 42-----*Xenomelaniris venezuelae* (Eigenmann)
- 2b. Posterior end of body cavity notably not reaching anal fin origin; belly compressed; anal fin base with a wide scaly sheath composed of two rows of scales along its entire length; first dorsal origin over bases of fourth or fifth branched rays of anal fin; maxillary reaching to below front part of eye; dorsal rays III—I, i, 7 or I, i, 8; anal rays I, i, 21 to I, i, 23; scales 44 to 48-----*Coleotropis blackburni*, new species.

Genus ADENOPS Schultz

Adenops SCHULTZ, Proc. U. S. Nat. Mus., vol. 98, p. 34, 1948. (Genotype, *Adenops analis* Schultz.)

This genus has the premaxillary dilated posteriorly; premaxillary or gape of mouth a little concave at side; rictus restricted by a

membrane folding between jaws; dentigerous surface of premaxillaries not reflected outward and covering face of that bone with "shagreen"; two dorsal fins present; silvery lateral band present; mouth small, the maxillary not reaching to eye; air bladder and body cavity not reaching anywhere near to opposite anal fin origin; first dorsal origin notably in front of anal origin; pelvic insertions much closer to opercular margin or upper angle of pectoral fin base than to anal origin; about 5 or 6 scales forming a sheath anteriorly along base of anal fin; margin of scales entire; distal margins of dorsal and anal fins concave; ascending process of premaxillary a narrow based spine-like projection; vertebrae in one count $16 + 24$.

It differs from all other genera of Atherinidae by having the anus far forward, equidistant between pelvic insertion and anal origin or nearer pelvic base than anal origin in combination with the four glandlike depressions on dorsal surface of snout and the body cavity nowhere near reaching to opposite the anal fin origin.

The only other related atherine fishes with the posterior end of the premaxillary dilated that have the anus far forward is *Archomenidia sallei* (Regan), but that genus has the air bladder and body cavity conspicuously extending some distance past the anal fin origin.

The only related genus of atherine fish with the four glandlike depressions on the dorsal surface of the snout is *Membras*, but that differs from *Adenops* in having the anus just in front of the anal-fin origin.

ADENOPS ANALIS Schultz

FIGURE 14

Adenops analis SCHULTZ, Proc. U. S. Nat. Mus., vol. 98, p. 34, 1948 (type locality, Lago de Maracaibo.)

Holotype.—U.S.N.M. No. 121824, a specimen, 59 mm. in standard length, collected by Leonard P. Schultz at night by flashlight in Lago de Maracaibo, 1 km. off Pueblo Viejo, Venezuela, on April 7–8, 1942.

Paratypes.—U.S.N.M. No. 121823, 66 specimens, 9 to 53.5 mm. in standard length, taken along with the holotype and bearing same data. There appear to be at least two age groups in this lot with 25 specimens 9 to 17.5 mm. and 41 fishes 19.5 to 53.5 mm.

Description.—Detailed measurements were made on the holotype and two paratypes, and these data, expressed in hundredths of the standard length, are recorded in table 16.

Greatest depth of body about 5.5 to 5.75, head 4.5 to 4¾, both in standard length; snout 3.5 to 3.75, orbit 3½ to 3.5, interorbital 3 to 3½, all in length of head; premaxillary a little curved, causing gape of mouth to be somewhat concave; mouth rather small, the maxillary not reaching to front of orbit; gill rakers slender, the longest about

$\frac{3}{4}$ diameter of pupil; rear margin of pupil about in middle of length of head; pelvic fin insertions a little closer to upper angle of pectoral fin base than to anal origin; anal origin equidistant between midbase of caudal fin and the second third of length of opercle; first dorsal origin conspicuously a little in front of a line through anal origin; second dorsal origin about over base of sixth from last anal fin ray; pelvic fins short usually reaching a trifle over halfway to anal origin; the anus is located nearly equidistant between anal origin and pelvic bases, but much closer to pelvic bases in the smaller ones; the body cavity extends only a trifle past anal opening; the ascending premaxillary processes are long, slender, with narrow bases, not triangular in shape; pectoral fins pointed, reaching a short distance past pelvic bases; interorbital space a little convex, belly rounded; posterior margins of scales entire; silvery lateral band present, wider than pupil anteriorly, but constricted a little on caudal peduncle where it is not quite as wide as pupil; least depth of caudal peduncle $2\frac{1}{2}$ to $2\frac{3}{4}$ in its length; lower jaw a little shorter than upper, slightly included; teeth minute in both jaws in a narrow villiform band.



FIGURE 14.—*Adenops analis* Schultz: Holotype (U.S.N.M. No. 121824), 59 mm. in standard length. Drawn by Mrs. Aime M. Awl.

The following counts were made, respectively: Dorsal rays, IV-I, i, 8; V-I, i, 7; and IV-I, i, 7. Anal rays I, i, 14; I, i, 14; and I, i, 14. Pelvics always I, 5. Pectoral rays, i, 12-i, 12; and i, 12. Branched caudal rays 15; 15; 15. Scales above lateral line to first dorsal origin $3\frac{1}{2}$; $3\frac{1}{2}$; $3\frac{1}{2}$; and below lateral line to anal origin $2\frac{1}{2}$; $2\frac{1}{2}$; and $2\frac{1}{2}$. Scales in the lateral line 44; 44; 44. Scales in front of first dorsal to rear of pigmented area over brain 20; 21; 20. Scales between anal origin and anus 4; 4; 4. Scales between dorsal bases of dorsal fins 7; 7; 6. Zigzag scales around least depth of caudal peduncle 12; 12; and 12. Gill rakers on first gill arch 4 + 1 + 14; —; and 2 + 1 + 13. Additional counts will be found in table 16.

Coloration.—In alcohol, straw-colored with silvery lateral band, bordered above by a narrow dark streak, wider anteriorly; middorsal line with a prominent row of black pigment spots or cells; each scale

TABLE 16.—Measurements, expressed in hundredths of the standard length, for certain species of *Atherinidae*

Characters	<i>Colcotropis blackburni</i>		<i>Colcotropis starksi</i> Holotype	<i>Xenomclaniris brasiliensis</i>		<i>Adenops analis</i>			<i>Xenomclaniris venezuelae</i>
	Holotype	Paratype				Holotype	Paratype	Paratype	
Standard length in millimeters.....	82.0	45.0	108.5	68.0	102.5	59.0	34.8	33.0	31.7
Length of head.....	22.1	22.2	24.0	23.5	21.8	22.0	22.4	27.3	28.1
Greatest depth of body.....	21.2	18.9	23.0	16.9	17.4	15.9	17.2	17.4	17.3
Length of snout.....	6.95	6.66	7.74	7.21	7.31	7.29	6.16	8.48	7.88
Diameter of orbit.....	5.85	6.89	7.56	7.65	5.85	6.61	7.46	9.08	9.78
Postorbital length of head.....	10.0	9.56	9.30	10.6	10.0	10.0	9.67	11.2	10.4
Width of bony interorbital space.....	6.95	7.56	7.46	7.50	7.50	7.46	8.33	6.60	7.25
Length of caudal peduncle.....	20.6	20.7	16.7	19.6	22.4	20.3	22.4	18.8	19.6
Least depth of caudal peduncle.....	9.88	9.56	8.66	8.83	8.10	7.96	9.48	9.08	8.50
Greatest width of head.....	11.3	9.78	11.5	12.4	12.0	10.9	9.48	11.2	12.9
Distance from:									
Pelvic insertion to anal origin.....	15.5	17.3	17.3	21.6	21.0	22.7	22.4	18.8	18.0
Snout tip to first dorsal origin.....	57.8	58.0	60.0	57.4	58.5	57.6	56.6	57.0	59.0
Snout tip to second dorsal origin.....	72.4	70.2	74.6	72.0	71.6	73.6	73.0	73.9	73.8
Snout tip to anal origin.....	52.0	53.2	55.6	61.8	59.0	62.7	61.7	58.8	59.9
Snout tip to pectoral insertion.....	21.8	22.9	24.7	24.1	22.4	22.5	23.3	26.7	27.7
Snout tip to pelvic insertion.....	37.1	36.0	40.1	42.7	38.1	40.3	40.8	40.9	42.0
First dorsal to second dorsal origin.....	15.2	12.9	15.0	14.4	13.1	16.3	17.2	16.4	13.6
Anal origin to center of anus.....	4.50	4.45	3.87	3.85	2.63	9.66	10.5	4.54	3.78
Length of longest ray of:									
First dorsal fin.....	5.85	5.34	4.60	6.62	6.34	8.64	7.18	7.57	6.94
Second dorsal fin.....		11.3	11.8	12.2		9.15	10.3	11.5	7.88
Anal fin.....	14.0	15.1	13.3	15.7	13.6	12.2	12.4	16.4	
Pectoral fin.....	18.3		21.5	20.0	20.5		16.4	20.3	23.0
Pelvic fin.....	10.2	10.0	10.4	13.2	11.8	10.9	10.3	13.6	12.6
Length of next to last ray of second dorsal.....						4.58	4.62	4.31	
Length of last dorsal ray.....	6.70	6.66	5.53	6.18	5.56	6.95	6.59	5.17	
Length of depressed second dorsal fin.....	15.4	16.7	13.8	14.4	13.4	15.4	15.8	15.1	14.2
Length of depressed anal fin.....	33.8	31.3	35.9	27.8	25.1	25.1	24.1	26.7	26.8
Length of base of second dorsal fin.....	9.14	10.0	8.11	8.09	7.80	9.49	8.62	7.57	7.88
Length of base of anal fin.....	28.1	27.1	29.9	21.2	19.9	18.8	18.7	23.0	23.0
Length of accessory pelvic scale.....	3.90	4.21	3.68	4.12	4.20			3.36	

of back above silvery lateral band with a black spot, some scales with two of these small pigment spots, thus making 2 rows of spots each side of middorsal line; tip of snout with black pigment; a few black pigment cells on sides of lower jaw and a few near its tip.

Genus XENOMELANIRIS Schultz

Xenomelaniris SCHULTZ, Proc. U. S. Nat. Mus., vol. 98, p. 33, 1948. (Genotype, *Atherina brasiliensis* Quoy and Gaimard.)

XENOMELANIRIS BRASILIENSIS (Quoy and Gaimard)

SILVERSIDES; PEJERREY DE MAR

Atherina brasiliensis QUOY AND GAIMARD, Voyage autour du monde . . . "L'Uranie" et "La Physicienne," Poissons, p. 332, 1824 (ref. copied).

Thrina brasiliensis JORDAN AND HUBBS, A monographic review of the family of Atherinidae or silversides, p. 59, 1919 (Lago de Maracaibo).—HUBBS, Occ. Pap. Mus. Zool. Univ. Michigan, No. 88, p. 3, 1920 (salt and brackish waters from Lago de Maracaibo to Río de Janeiro, Brazil).

U.S.N.M. No. 121822, 1 specimen, 100 mm., Maracaibo Yacht Club, Maracaibo, March 5, 1942.

U.S.N.M. No. 121821, 2 specimens, one 68 mm., the other with broken caudal peduncle, Maracaibo Yacht Club, Maracaibo, February 27, 1942.

U.S.N.M. No. 123204, 10 specimens, 245 to 48.5 mm., Point Macolla, U. S. S. Niagara, April 19, 1925.

Three specimens, 15 to 50 mm. in standard length, Laguna del Río Capatárida at mouth, 5 km. north of Capatárida, F. F. Bond, March 21, 1938.

I have made counts and measurements on the above-listed material and have compared these with similar counts made on specimens from Trinidad and Brazil. Because of a large variation and a small series of specimens it is not possible to separate the Lago de Maracaibo population from that of the Gulf of Venezuela or of Brazil. Perhaps when an adequate number of specimens has been studied throughout the range of this species, it may be possible to break it up into subspecies.

XENOMELANIRIS VENEZUELAE (Eigenmann)

PEJERREY DE AGUA DULCE

Menidia venezuelae EIGENMANN, Indiana Univ. Stud., vol. 7, No. 44, p. 12, 1920 (Río Tapa Tapa, Lago de Valencia Basin, Venezuela).

I have had for examination five small specimens, 25.5 to 33.5 mm. in standard length, collected by Dr. F. F. Bond at La Boca, Lago de Valencia, June 20, 1938.

Measurements and counts were made on the above-mentioned lot, and these data are recorded in tables 15 and 16, respectively.

Genus COLEOTROPIS Myers and Wade

Colcotropis MYERS AND WADE, Allan Hancock Pacific Expedition, vol. 9, No. 5, p. 136, 1942. (Genotype, *Menidia starksi* Meek and Hildebrand.)

COLEOTROPIS BLACKBURNI, new species

PEJERREY DE MAR

FIGURE 15

Holotype.—U.S.N.M. No. 123205, a specimen 82 mm. in standard length, collected in the Gulf of Venezuela at Jacuque Point, by the U. S. S. *Niagara* on January 26, 1925.

Paratypes.—U.S.N.M. No. 123207, 4 specimens 45 to 65 mm. in standard length, collected in the Gulf of Venezuela at Point Macolla, by the U. S. S. *Niagara*, April 19, 1925; U.S.N.M. No. 123206, 2 specimens, 36 to 37.5 mm., collected in the Gulf of Venezuela by the U. S. S. *Niagara*, April 4, 1925.

Description.—Detailed measurements were made on the holotype and one paratype, and these data, expressed in hundredths of the standard length, are recorded in table 16.

Greatest depth of body 4.8 to 5.25, head 4.5 to 4.75, both in standard length; snout 3.25 to 3.5, orbit 2.8 to 3.5, interorbital 2.8 to 3, all in length of head; premaxillary a little curved, causing gape of mouth to be somewhat concave; mouth of moderate size, the posterior tip of maxillary reaching to under front margin of orbit; gill rakers rather slender, the longest about equal to diameter of pupil; rear margin of pupil at or very slightly in advance of midlength of head; pelvic fin insertions about equal distance between anal origin and upper angle of pectoral fin base; anal fin origin equidistant between midbase of caudal fin and near middle of length of snout; first dorsal origin conspicuously behind a vertical line through anal origin, about over base of second branched anal ray; second dorsal origin over beginning of last third of length of anal fin base; pelvic fins reaching from one-half to two-thirds the way to anal origin but not quite to anus; anus is located a very short distance in front of anal origin but much closer to anal origin than to base of pelvics; the body cavity and air bladder notably do not extend posteriorly to opposite the anal fin origin; the ascending premaxillary process is broadbased, and triangular in shape; pectoral fins pointed reaching about halfway out length of pelvics; interorbital space slightly convex; belly somewhat compressed, not fully rounded; posterior margins of scales entire, not crenulate; silvery lateral band much wider than pupil anteriorly, then partially constricted on caudal peduncle and narrower than pupil, thence a little wider before ending at base of caudal fin; least depth of caudal peduncle not quite twice in its length; lower jaw a littler shorter than upper, and a little included; teeth small, in upper jaw in two rows, these separated by a narrow nondentigerous space, those in lower jaw in two rows anteriorly, becoming one row on sides; the posterior end of dentary scarcely elevated; a scaly sheath along base of anal fin, two scales wide anteriorly.

The following counts were made, respectively, for holotype and paratype: Dorsal rays III-I, i, 7 and III-I, i, 7. Anal rays I, i, 22 and I, i, 22. Pectoral rays i, 12-i, 13 and i, 12-i, 12. Pelvics always I, 5 and branched caudal fin rays always 15. Scales from first dorsal origin to lateral line 5 and 5 and from lateral line to anal origin 4 and 4. Scale rows from head to midbase of caudal fin 45 and 48. Scales from first dorsal origin to pigmented area over brain 22 and 23. One or two scales between anal origin and anus. Scales between bases of dorsal fins 7 and 7. Zigzag scales around least depth of caudal peduncle 16 and 16. Gill rakers on first gill arch 3 + 1 + 15 and 3 + 1 + 15. Vertebral count for one of the paratypes 14 + 27.

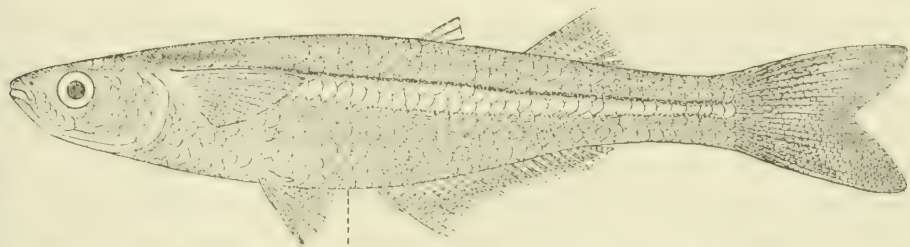


FIGURE 15.—*Coleotropis blackburni*, new species: Holotype (U.S.N.M. No. 123205), 82 mm. in standard length. Drawn by Mrs. Aime M. Awl.

Coloration.—In alcohol, plain except for silvery lateral band which has a blackish dorsal border; a few dark pigment cells still visible on posterior border of scales that occur above silvery lateral band.

Remarks.—This new species is related to *Coleotropis starksii* (Meek and Hildebrand) from the Pacific side of Panama but differs from that species by having I, i, 21 to I, i, 23 anal rays instead of I, i, 25 to I, i, 28. In addition *C. blackburni* has 44 to 48 scales instead of 41 to 42 as in *C. starksii*.

Named in honor of Capt. P. P. Blackburn, of the U. S. S. *Niagara*, who preserved all the fishes collected in Venezuelan waters in 1924-1925 reported upon in this contribution. It gives me great pleasure to name this interesting species of silverside after Captain Blackburn.

Family SPHYRAENIDAE: Barracudas

Genus SPHYRAENA Walbaum

Sphyraena WALBAUM, Artedi's Bibliotheca ichthyologica, vol. 3, pp. 94, 584, 1792. (Genotype, *Esox barracuda* Walbaum.)

SPHYRAENA BARRACUDA (Walbaum)

PICUDA

Esox barracuda WALBAUM, Artedi's Bibliotheca ichthyologica, vol. 3, pp. 94, 584, 1792 (West Indies).

Sphyraena barracuda RÖHL, Fauna descriptiva de Venezuela, p. 392, fig. 201, 1942 (coast of Venezuela).

U. S. N. M. No. 123220, large head, Punta Gorda, east coast of Gulf of Venezuela, U. S. S. *Niagara*, December 18, 1924. This specimen measured 4 feet 6 inches in total length and weighed 33½ pounds.

SPHYRAENA GUACHANCHO Valenciennes

GUAGUANCHO

Sphyraena guachancho VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 3, p. 252, 1829 (Havana).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904–1905, p. 41, 1919 (Puerto Cabello, Venezuela).

Family MUGILIDAE: Mulletts; Lisas

No careful comparison of European and American mullets has been made; *Mugil cephalus* therefore is usually considered to have a world-wide distribution. However, my preliminary study of specimens of *M. cephalus* from Europe compared with some American ones indicates possible differences. Before any definite conclusion can be reached a large series will have to be studied. I have not found any specimen from Venezuela that could be definitely classified as *cephalus*, and I have serious doubt that *M. cephalus* occurs along the east coast of South America or in the West Indies.

During my study of the mullets of Venezuela I considered it necessary to revise provisionally the genera of Mugilidae, since much confusion exists in regard to genera. The results of this preliminary revision have been published (Schultz, 1946).

KEY TO THE GENERA AND SPECIES OF MUGILIDAE REPORTED FROM VENEZUELA

- 1a. Upper and lower jaws inside of lips with a wide band of villiform teeth, but no teeth on outer margin of lips, nor is the lower lip directed or folded downward; anterior margin of lower jaw broadly rounded; gill rakers about 17 to 20 on lower part of first gill arch; maxillary reaching past front of orbit and past posterior tip of preorbital bone; lower lip thick, not thin at edge and not bearing teeth; no adipose eyelid; nostrils much closer together than anterior is from edge of snout, lip excluded; anal rays III, 9; scales about 38 to 41.-----**Agonostomus monticola** (Bancroft)
- 1b. Lower jaw without a wide band of villiform teeth; gill rakers more than 25 on lower part of first gill arch; lower lip with a thin edge directed horizontally forward or nearly so, usually with a uniserial row of slender simple teeth more or less ciliform, sometimes embedded and almost obsolete; upper jaw with or without a narrow band of minute villiform teeth and lip usually with a single row of minute slender teeth; adipose eyelid well developed, reaching to or nearly to pupil except on young 40 mm. in standard length and shorter, in which case the preorbital is narrower than space between nostrils; nostrils wider apart than anterior nostril is from edge of snout, lip excluded; anterior margin of lower jaw triangular in shape; preorbital posteriorly narrower than distance between nostrils and its posterior tip not reaching front of eye; maxillary reaching to rear edge of preorbital but not beyond front of eye (*Mugil*).

2a. Anal rays III, 9; dorsal and anal fins heavily scaled.

3a. Scales usually 38 to 41 (rarely 37 or 42); accessory scales at base of first dorsal reach from four-fifths to past tip of fourth dorsal spine; least depth of caudal peduncle into distance from tip of first dorsal fin to second dorsal origin 0.54 to 1.1; snout tip to first dorsal origin into distance from first dorsal origin to midbase of caudal fin 0.94 to 1.13; distance from tip of depressed first dorsal to origin of second dorsal fin into snout tip to origin of first dorsal 4.04 to 8.26; depth 3.53 to 4.7 and head 3.06 to 3.92 in standard length.

Mugil curema Valenciennes

3b. Scales usually about 45 or 46; accessory scales at base of first dorsal reaching one-third to three-fourths the way to tip of fourth dorsal spine; depth 4.3 to 5.0 and head 3.7 to 4.2 in standard length.

Mugil incilis Hancock

2b. Anal rays III, 8.

4a. Scales 31 to 34; depth 4.2 to 5.0, head 3.7 to 4.0 in standard length; least depth of caudal peduncle about 1 to 1.1 in distance from tip of depressed first dorsal to origin of second dorsal; distance from tip of snout to origin of first dorsal into distance from origin of first dorsal to midbase of caudal fin about 1.1; anal and dorsal fins scaled anteriorly and basally only on interradi al membranes.

Mugil brasiliensis Spix

4b. Scales 29 to 32; depth 3.3 to 3.4, head 3.3 to 3.6 in standard length; least depth of caudal peduncle 0.3 to 0.4 in distance from tip of depressed first dorsal to origin of second dorsal; distance from tip of snout to origin of first dorsal into distance from origin of first dorsal to midbase of caudal fin 0.9 to 1.0; anal and dorsal fins heavily scaled.

Mugil trichodon Poey

Genus AGONOSTOMUS Bennett

Agonostomus BENNETT, Proc. Committee Sci. Correspond. Zool. Soc. London, No. 14, p. 166, 1832. (Genotype, *Agonostomus telfairii* Bennett, from Mauritius.)

AGONOSTOMUS MONTICOLA (Bancroft)

LISA DE AGUA DULCE, o DAJAO

Mugil monticola BANCROFT, in Griffith's ed. Cuvier's Animal Kingdom, Fishes, p. 367, pl. 36, 1836 (Jamaica) (ref. copied).

U.S.N.M. Nos. 93811-93813, 93818-93819, and 93826, totaling 16 specimens, 61 to 179 mm. in standard length, from a fresh-water stream at Macuto, Venezuela, August 1-2, 1900, collected by Lyon and Robinson.

The following collections were made by Dr. F. F. Bond:

2 specimens, both 61 mm., Río Cumboto, near mouth, 2 km. northwest of Ocumare, May 5, 1939.

3 specimens, 30.5 to 37 mm., Río Guaiguaza, 3 km. west of Puerto Cabello, January 15, 1938.

4 specimens, 28 to 66 mm., Río Cumboto near Ocumare, January 5, 1938.

1 specimen, 51.5 mm., lagoon, 3 km. west of Cumaná on road to Cumanacoa, March 26, 1939.

1 specimen, 73 mm., tributary to Río San Pedrito, 55 km. east of Barcelona, March 25, 1939.

2 specimens, 35 and 36 mm., Río Agua Caliente at Tavorda, 6 km. west of Puerto Cabello, January 15, 1938.

30 specimens, 23 to 106 mm., Río Cerro Grande, 10 km. east of Macuto, December 22, 1937.

43 specimens, 22 to 43.5 mm., Río Mamo, 15 km. west of La Guaira, November 11, 1938.

In the young of *A. monticola*, the rear end of the maxillary scarcely reaches to the eye at a standard length of 50 mm., but in adults 150 mm. and longer the maxillary reaches well past the front of the orbit, sometimes to under the front of the pupil. I am unable to find any significant differences in any counts made on Venezuelan specimens and other localities in the West Indies and Central America. The origin of the dorsal fin is equidistant between tip of snout or a little closer to tip of snout.

The following counts were made on Venezuelan specimens: Anal rays III, 9 in 14; gill rakers 9 to 12 + 1 + 17 to 20 on first arch in 8 specimens; scales 38 in 1, 39 in 2, and 40 in 6 specimens.

Genus MUGIL Linnaeus

Mugil LINNAEUS, *Systema naturae*, ed. 10, vol. 1, p. 316, 1758. (Genotype, *Mugil cephalus* Linnaeus.)

MUGIL CUREMA Valenciennes

MULLET; LISA

Mugil curema VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 11, p. 87, 1836 (Brazil, Martinique, Cuba).

?*Mugil cephalus* RÖHL, *Fauna descriptiva de Venezuela*, p. 392, fig. 200, 1942 (Venezuela).

Myzus calancae DE BEAUFORT, *Freshwater fishes from the Leeward Group, Venezuela and eastern Columbia: Studies on the fauna of Curaçao, Aruba, Bonaire, and the Venezuelan Islands*, vol. 2, p. 112, pl. Xa, 1940 (Goajira, lower course of the Río Calancale near San Antonio, Colombia).

I have compared De Beaufort's description and figure of his new species in connection with my revision of the genera of Mugilidae and find *calancae* to be in the querimana stage of development of *Mugil curema*, the commonest mullet along the northern shores of South America.

U.S.N.M. No. 121793, a specimen, 67.5 mm., from Lago de Maracaibo at Yacht Club, in Maracaibo, May 16.

U.S.N.M. No. 121794, 21 specimens, 8 to 61 mm., from Lago de Maracaibo at Yacht Club in Maracaibo, February 27.

U.S.N.M. No. 121792, 126 specimens, 20 to 173 mm., from Caño de Sagua, 25 km. north of Sinamaica, March 12.

U.S.N.M. No. 121797, 1 specimen, 19 mm., Caño de Los Monitos, Río Limón system, north of Maracaibo, March 11.

U.S.N.M. No. 121795, 5 specimens, 147 to 218 mm., from Lago Maracaibo near mouth of Río Concha, May 2.

U.S.N.M. No. 121796, 11 specimens, 74 to 240 mm., from mouth of Caño de Sagua, 25 km. north of Sinamaica, taken March 12, were separated from the other specimens of this species taken at the same place and date, U.S.N.M. No. 121792, because they appear to be more elongate, with a more slender caudal peduncle, and the space from tip of depressed first dorsal to origin of second dorsal is greater. There is too much overlapping, however, to permit the consideration of this lot as a new form.

The following collections were made by the U. S. S. *Niagara* in the Gulf of Venezuela:

U.S.N.M. No. 122969, 5 specimens, 24 to 149 mm., Point Macolla, April 19, 1925.

U.S.N.M. No. 122971, 12 specimens, 39 to 86 mm., Jacuque Point, January 26, 1925.

U.S.N.M. No. 122965, 4 specimens, 37 to 280 mm., Piedras Bay, March 14, 1925.

U.S.N.M. No. 122964, 2 specimens, 48 and 61 mm., Amuay Bay, December 9, 1924.

U.S.N.M. No. 122968, 4 specimens, 33 to 84 mm., south coast of Gulf, November 15, 1925.

U.S.N.M. No. 122970, 18 specimens, 27 to 30 and 143 mm., Salinas Bay, April 4-9, 1925.

U.S.N.M. No. 122967, 1 specimen, 30 mm., Estanques Bay, February 20, 1925.

U.S.N.M. No. 122966, 3 specimens, 16 to 30 mm., Cape San Román, April 2, 1935.

The following collections were made by F. F. Bond:

23 specimens, 19 to 44 mm., Río Cumboto near mouth, 2 km. northwest of Ocumare, May 5, 1939.

9 specimens, 43 to 64 mm., salt-water lagoon on coast, 5 km. west of Cumaná, March 25, 1939.

2 specimens, 94 and 99 mm., Río Cumboto near Ocumare, January 5, 1938.

10 specimens, 25 to 30 mm., Río Cerro Grande, 10 km. east of Macuto, December 22, 1937.

13 specimens, 39 to 49 mm., Laguna del Río Capatárida, at mouth, 3 km. north of Capatárida, March 21, 1938.

3 specimens, 28 to 47.5 mm. Laguna de Tacarigua, Estado de Miranda, February 3, 1939.

5 specimens, 25.5 to 51 mm., baja seco east side of Puerto Cabello, January 26, 1938.

6 specimens, 28 to 38 mm., "Paparo," Estado de Miranda, February 2, 1939.

The following counts were made: Anal rays III,9 on 32 specimens; scales 38 on 6, 39 on 11, 40 on 9, 41 on 4, and 42 on 1.

MUGIL INCILIS HANCOCK

Mugil incilis HANCOCK, Quart. Journ. Sci., 1830, p. 127 (Guiana) (ref. copied).

U. S. N. M. No. 121791, 2 specimens, mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942:

3 specimens, 43 to 44.5 mm., Río Borburata at mouth, 3 km. east of Puerto Cabello, F. F. Bond, January 15, 1938.

The following counts were made: Anal rays III,9 on 5 specimens and scales 45 on 2 and 46 on 2 specimens.

MUGIL BRASILIENSIS Spix

MULLET; LEBRANCHO

Mugil brasiliensis SPIX, in Spix and Agassiz, *Selecta genera et species piscium* . . . Brasiliam . . ., p. 134, pl. 72, pl. F, 1831 (Ocean at Brazil).—RÖHL, *Fauna descriptiva de Venezuela*, p. 391, 1942 (coast of Venezuela).

Mugil liza VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 11, p. 83, 1836 (Brazil, Surinam, Puerto Rico, Maracaibo, Martinique, Cuba).

U.S.N.M. No. 121788, 6 specimens, 215 to 250 mm., market at Maracaibo, probably caught in El Tablazo, May 15, 1942.

U.S.N.M. No. 121789, 2 specimens, 305 and 310 mm., Salina Rica, north of Maracaibo, March 12, 1942.

U.S.N.M. No. 121786, 3 specimens, 93 to 100 mm., Lago de Maracaibo at Maracaibo Yacht Club, May 16, 1942.

U.S.N.M. No. 121787, 3 specimens, 44 to 115 mm., from Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

U.S.N.M. No. 122972, 1 specimen, 360 mm. in standard length, Gulf of Venezuela, U. S. S. *Niagara*, February 20, 1925.

The following counts were made: Anal rays III,8 on 15 specimens; scales 31 in 1, 32 in 2, 33 in 7, and 34 in 3 specimens.

MUGIL TRICHODON Poey

LISA

Mugil trichodon POEY, *Ann. Lyc. Nat. Hist. New York*, vol. 11, p. 66, pl. 8, figs. 4-8, 1875 (Cuba).

U.S.N.M. No. 121970, 9 specimens, 26 to 89 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

U.S.N.M. No. 122963, 1 specimen, 91 mm., Cape San Román, Gulf of Venezuela, U. S. S. *Niagara*, April 2, 1925.

The following collections were made by F. F. Bond:

10 specimens, 21 to 23 mm., Río Sanchón, 5 km. west of Tavorda, January 26, 1938.

29 specimens, 19 to 22 mm., Río Cerro Grande, 10 km. east of Macuto, December 22, 1937.

107 specimens, 19 to 27 mm., Río Yaracuy, Boca Yaracuy, 45 km. northwest of Puerto Cabello, January 28, 1938.

29 specimens, 23 to 24 mm., Río Borburata at mouth, 3 km. east of Puerto Cabello at Gañanga, January 15, 1938.

14 specimens, 21.5 to 27 mm., bajo seco east side of Puerto Cabello, January 26, 1938.

1 specimen, 35 mm., Laguna del Río Capatárida, at mouth, 5 km. north of Capatárida, March 21, 1938.

7 specimens, 19 to 26 mm., coastal lagoons, 15 km. north of Maracaibo, April 6, 1938.

The following counts were made: Anal rays III,8 in 9 specimens; scales 29 in 1, 30 in 3, 31 in 3, and 32 in 3 specimens.

Suborder POLYNEMOIDEA

Family POLYNEMIDAE: Threadfins; Barbudos

Genus POLYDACTYLUS Lacepède

Polydactylus LACEPÈDE, Histoire naturelle des poissons, vol. 5, p. 419, 1803.
(Genotype, *Polydactylus plumierii* Lacepède = *Polynemus virginicus* Linnaeus.)

POLYDACTYLUS VIRGINICUS (Linnaeus)

BARBUDO

Polynemus virginicus LINNAEUS, Systema naturae, ed. 10, p. 317, 1758 (America).

The following collections were made by the U. S. S. *Niagara* in the Gulf of Venezuela in 1925:

U.S.N.M. No. 123180, 1 specimen, 44 mm. in standard length, from Jacuque Point, January 26.

U.S.N.M. No. 123178, 3 specimens, 45.5 to 47 mm., Piedras Bay, March 14.

U.S.N.M. No. 123179, 7 specimens, 48 to 52 mm., Cape San Román, April 2.

U.S.N.M. No. 123181, 4 specimens, 47 to 49 mm., Gulf of Venezuela, April 4.

U.S.N.M. No. 123182, 12 specimens, 42 to 54 mm., Estanques Bay, February 20.

Suborder PERCOIDEA

Family CENTROPOMIDAE: Robalos

Only two species of *Centropomus* have been collected in Venezuelan waters, although additional forms are to be expected, such as the widely ranging *C. pectinatus* and *C. parallelus*.

Genus CENTROPOMUS Lacepède

Centropomus LACEPÈDE, Histoire naturelle des poissons, vol. 4, p. 248, 1802.
(Genotype, *Sciaena undecimalis* Bloch.)

KEY TO THE SPECIES OF CENTROPOMUS FROM VENEZUELA

- 1a. Scales 66 to 72 from supraclavicle serrae to base of caudal fin above lateral line; gill rakers on first gill arch, not counting rudiments, about 3+1+7 or 8 and by counting all rudiments about 6+1+13 or 14; preorbital edge smooth or nearly so; eye 5 to 6.5 in head; second anal spine not quite reaching to opposite base of caudal fin; depth about 4 to 4.8 in standard length; dorsal rays VIII-I, 10; anal III, 6; pectorals ii, 13 or ii, 14; lateral line with a black streak; interspinous membranes of dorsal fin blackish from base to tips, sometimes intensely black distally.

Centropomus undecimalis (Bloch)

- 1b. Scales about 54 to 56 from supraclavicle serrae to base of caudal fin above lateral line; gill rakers on first gill arch, not counting rudiments, about 6+1+11 or 12 and by counting all rudiments 9+1+16 or 17; preorbital edge serrate; eye 4 to 5.5 in head; anal spine very long, usually reaching a little beyond caudal fin base and much longer than length of caudal peduncle; depth about 3.5 in standard length; dorsal rays VIII-I, 10; anal III, 6; pectorals ii, 13 or 14; lateral line without black streak; interspinous membranes of dorsal fin blackish from base to tips-----*Centropomus ensiferus* Poey

CENTROPOMUS UNDECIMALIS (Bloch)

ROBALO

Sciaena undecimalis BLOCH, Naturgeschichte der ausländischen Fische, vol. 6, p. 60, pl. 303, 1792 (Jamaica).

Centropomus undecimalis RÖHL, Fauna descriptiva de Venezuela, p. 402, fig. 216, 1942 (coast of Venezuela).

U.S.N.M. No. 121740, 2 specimens, 87 and 108 mm. in standard length, Lago de Maracaibo, opposite Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121739, a specimen, 119 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

U.S.N.M. No. 121741, 2 specimens, 67 and 78 mm., Salina Santa Rosa, 3 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121733, 3 specimens, 118 to 140 mm., Lago de Maracaibo at Yacht Club, Maracaibo, February 27 and March 5, 1942.

U.S.N.M. No. 121734, 3 specimens, 66 to 192 mm., Lago de Maracaibo at Yacht Club, May 16, 1942.

U.S.N.M. No. 121737, a specimen, 178 mm., caño $\frac{1}{2}$ mile west of Sinamaica, March 11, 1942.

U.S.N.M. No. 121735, 10 specimens, 94 to 143 mm., Salina Rica, 5 km. north of Maracaibo, in brackish water, February 20, 1942.

U.S.N.M. No. 121736, 4 specimens, 130 to 205 mm., Río Socuy, 3 km. above mouth, February 24, 1942.

U.S.N.M. No. 121732, 11 specimens, 91 to 210 mm., Lago de Maracaibo, 7 km. south of Maracaibo, March 6, 1942.

U.S.N.M. No. 121738, 1 head, Río de Los Pájaros, 3 km. above Lago de Maracaibo, April 30, 1942.

U.S.N.M. No. 123065, 1 specimen, 360 mm. in standard length, Amuay Bay, U. S. S. *Niagara*, May 15, 1925.

The following collections were made by F. F. Bond:

2 specimens, 66.5 to 92 mm., Río Sanchón, 5 km. west of Tavorda, January 26, 1938.

3 specimens, 58.5 to 82 mm., Laguna de Tacarigua, Estado de Miranda, February 3, 1939.

3 specimens, 39 to 67 mm., a bajo seca, east side of Puerto Cabello, January 26, 1938.

2 specimens, 52.5 and 85 mm., salt-water lagoon on coast, 5 km. west of Cuamáná, March 25, 1939.

6 specimens, 32 to 39 mm., Laguna de Río Capatárida, March 21, 1938.

This species was observed in the mouth of Caño de Sagua to reach a length of nearly 3 feet. No specimens of such large size were preserved but one was photographed.

CENTROPOMUS ENSIFERUS Poey

ROBALO

Centropomus ensiferus POEY, Memorias sobre la historia natural de la isla de Cuba, vol. 2, p. 122, pl. 12, fig. 1, 1860 (Havana).

U.S.N.M. No. 121728, 4 specimens, 46 to 138 mm., Lago de Maracaibo at Yacht Club, Maracaibo, February 27 and March 5, 1942.

U.S.N.M. No. 121727, 17 specimens, 53 to 70 mm., Lago de Maracaibo, opposite Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121729, a specimen, 138 mm., Lago de Maracaibo, 7 km. south of Maracaibo, March 6, 1942.

U.S.N.M. No. 121730, 2 specimens, 137 and 150 mm., Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121731, 3 specimens, 84 to 147 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

One specimen, 74 mm., Laguna de Tacarigua, Estado de Miranda, F. F. Bond, February 3, 1939.

Family SERRANIDAE: Sea Basses

This family is so poorly represented from Venezuela that it is not practicable to make a key. Instead, the reader is referred to volume 2, pp. 435-436, of Meek and Hildebrand's "The Marine Fishes of Panama" for a key to the genera of Serranidae likely to occur in Venezuela.

Genus PARALABRAX Girard

Paralabrax GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 8, p. 131, 1856. (Genotype, *Labrax nebulifer* Girard.)

PARALABRAX DEWEGERI (Metzelaar)

Serranus (Paralabrax) dewegeri METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies, 1904-1905, p. 52, fig. 20, 1919 (Guanta, Venezuela).

U.S.N.M. No. 123134, a specimen, 127.5 mm. in standard length, from south coast of Gulf, U. S. S. *Niagara*, November 7, 1924.

As this species has never been recognized since its original discovery and probably the specimen before me is only the third one collected and made known, I am giving the following rather full diagnosis and a comparison with other species closely related to it:

The following measurements, expressed in hundredths of the standard length, were made: Greatest depth of body 35.5; length of head 43.9; length of snout 12.5; least width of bony interorbital space 4.97; diameter of eye 8.78; postorbital length of head 23.1; least width of preorbital space 4.31; distance from tip of snout to rear edge of maxillaries 19.0; length of longest gill rakers 3.37; length of caudal peduncle or from rear base of last anal ray to midbase of caudal fin 21.4; least depth of caudal peduncle 14.3; length of pelvic spine 11.4; length of spines of dorsal fin—first 5.49, second 10.1, third 18.3, fourth 19.5, fifth 14.9, sixth 12.8, seventh 12.4, eighth 11.4, ninth 11.2, tenth 13.7; length of anal spines—first 6.20, second 11.8, third 11.9; longest soft ray of dorsal fin 17.9; of anal fin 19.6; of pectoral fin 23.0; of pelvic fin 20.4; longest ray of caudal fin 24.8; distance from tip of snout to origin of dorsal fin 42.6, and to origin of anal fin 63.0; snout tip to pectoral fin insertion 35.5 and to pelvic insertion 37.4.

The following counts were made: Dorsal rays X, 14; anal rays III, 7; pectoral fin rays i, 16-i, 16; branched caudal fin rays $8 + 7 = 15$; pelvic rays I, 5-I, 5; gill rakers on first gill arch $7 + 1 + 13$; number of transverse scale rows just above lateral line from upper edge of gill opening to midbase of caudal fin 75; pores in lateral line 55 with 8 additional ones on caudal fin; scales from dorsal origin to lateral line 11 or 12 and from base of first soft ray of dorsal to lateral line 8; scales from anal origin upward to lateral line 19 or 20 in an oblique row; zigzag scales around least width of caudal peduncle 39 or 40.

Body a little compressed, greatest depth through middle of spiny dorsal; caudal peduncle a little compressed; pelvics inserted under base of pectoral fins; dorsal origin over base of pectorals; anal origin under base of second or third soft ray of dorsal fin and anus close in front of anal fin; distal margin of caudal fin truncate or a little rounded when fully distended; distal margins of soft dorsal and anal fins rounded, that of pectoral rounded with the seventh to ninth branched rays longest, counting down from the dorsal edge; third and fourth dorsal spines longest, the fourth projecting a little beyond third and fifth spines; second and third anal spines projecting about the same amount; scales small, ctenoid, covering body and bases of all fins, and the scales extending two-thirds the way out on the rays of caudal, pectoral, and pelvic fins but not over halfway out on soft dorsal and anal fins; scales occur only on the basal third of the dorsal spines, the membranes being naked; scales occur on operculum and cheeks and forward on top of head to a line connecting across rear of orbits, the rest of the top of head and snout naked; underside of head naked; scales in front of pelvics smaller than elsewhere on body; lower jaw projecting but not quite entering profile; gill membranes free from isthmus, extending far forward; gill rakers moderately long, not quite so long as the least width of the preorbital; each pair of nasal openings separated by a narrow dermal isthmus; the anterior nasal opening, tubelike, with a fringed dermal flap posteriorly; the rear opening with a low fringed tube; interorbital space flat; maxillary reaching to under or a little past rear edge of pupil; teeth on dentary in an enlarged row of short caninelike teeth with a few tiny ones at sides but in a band anteriorly; teeth on upper jaw similar but in a narrow band on sides; villiformlike teeth on vomer and palatines, but apparently no teeth on tongue or pterygoids.

Color in alcohol.—Lower sides with 7 dark brown vertical bars, about twice width of pale interspaces; these bars join along middle of sides to form an irregular mottled pattern; upper sides dark brown with several narrow oblique bars ending at lateral line; posteriorly under soft dorsal two of the vertical dark brown bars are visible and two more on caudal peduncle, these continuous from those ventrally; base of caudal fin with 4 dark brown spots surrounded with paler tan; caudal fin with numerous dark brown spots; base of pectoral fin with dark

brown blotch circled with pale, then posteriorly at base of fin a dark circle; a dark bar extends downward from eye ending on subopercle; pelvic fins very dark brown or blackish; anal and pectorals brown; membranes near tips of dorsal spines anteriorly blackish; soft dorsal mottled with brownish.

Paralabrax dewegeri is related to that group of fishes now represented by the following species: *humeralis* Cuvier and Valenciennes, *callaensis* Starks, *castelnaui* Jordan and Eigenmann, *clathratus* Girard, *nebulifer* Girard, *maculatofasciatus* Steindachner, *maculata* Howell-Rivero, *tortugarum* Longley, and *beta* Hildebrand.

From *nebulifer* and *maculatofasciatus* (of Pacific coast), which have the third dorsal spine much longer than the fourth, it differs by having the third dorsal spine a little shorter than the fourth, and in having fewer scale rows above the lateral line; *clathratus* (of Pacific coast) has more scales, 90 to 100, and more gill rakers, 20 to 24 on the lower part of first arch, instead of 75 and 13 or 14 respectively for *dewegeri*. Two other Pacific coast species, *humeralis* and *callaensis*, have 18 to 22 gill rakers on the lower part of first gill arch and the former has too many scales. *Paralabrax maculata* Howell-Rivero of the Atlantic has but X,11 dorsal rays and only 45 scales. *P. castelnaui* from Rio de Janeiro has but X,12 dorsal rays. There remain two species that may be related to the Venezuelan one, but not closely: They are *Serranus tortugarum* Longley (Carnegie Inst. Washington Year Book No. 34, p. 87, 1935; Longley and Hildebrand, Carnegie Inst. Washington Publ. 517, p. 238, fig. 8, 1940 [south of Tortugas, Fla.]) and *Serranus beta* Hildebrand in Longley and Hildebrand (*l. c.*), p. 239, fig. 9, 1940 (south of Tortugas, Fla.). Both of these species have too few soft dorsal rays, X,11 or 12 and X,12, and, in addition, too few scales, 50 or 60, respectively.

Genus HYPOPLECTRUS Gill

Hypoplectrus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 236. (Genotype, *Plectropoma puella* Cuvier and Valenciennes.)

HYPOPLECTRUS UNICOLOR (Walbaum)

Perca unicolor WALBAUM, Artdi's Bibliotheca ichthyologicae, vol. 3, p. 352, 1792 (locality not known) (ref. copied).

Hypoplectrus unicolor TORTONESE, Bol. Mus. Zool. Anat. Comp. Univ. Torino, vol. 47, No. 89, p. 52, 1939 (Puerto Cabello, Venezuela).

Genus DIPLECTRUM Holbrook

Diplectrum HOLBROOK, Ichthyology of South Carolina, ed. 1, p. 32, 1855. (Genotype, *Diplectrum fasciculare* Holbrook = *Perca formosa* Linnaeus.)

DIPLECTRUM RADIALE (Quoy and Gaimard)

Serranus radialis QUOY AND GAIMARD, in Freycinet, Voyage autour du monde . . . "L'Uranie" et "La Physicienne," Poissons, p. 316, 1824 (Rio de Janeiro).

Serranus (Diplectrum) radialis METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies, 1904-1905, p. 54, 1919 (Cumaná, Venezuela).

U.S.N.M. No. 123132, 1 specimen, 103 mm., Amuay Bay, U. S. S. *Niagara*, December 9, 1924.

Genus RYPTICUS Cuvier

SOAFFISHES

Rypticus CUVIER, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 3, p. 60, 1829. (Genotype, *Anthias saponaceus* Bloch and Schneider.)

RYPTICUS ARENATUS Cuvier

PEZ JABON

Rypticus arenatus CUVIER, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 3, p. 65, pl. 46, 1829 (Brazil).

For a revision of this genus see Schultz and Reid, Proc. U. S. Nat. Mus., vol. 87, pp. 261-270, 1939. On page 269, table 1, the preopercular spines for *R. arenatus* were transposed; they should read 2 in column 2 and 32 in 3.

U.S.N.M. No. 121809, a specimen, 114 mm. in standard length, mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

Genus EPINEPHELUS Bloch

MEROS

Epinephelus BLOCH, Naturgeschichte ausländischen Fische, vol. 7, p. 11, 1793. (Genotype, *Epinephelus marginalis* Bloch=*Perca fasciata* Forskål.) (Ref. copied.)

EPINEPHELUS MORIO (Cuvier and Valenciennes)

MERO CHERNO

Serranus morio CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 2, p. 285, 1828 (New York and San Domingo) (ref. copied).

Epinephelus morio RÖHL, Fauna descriptiva de Venezuela, p. 403, fig. 218, 1942 (coast of Venezuela).

U.S.N.M. No. 123135, a specimen, 271 mm. in standard length, Estanques Bay U. S. S. *Niagara*, December 13, 1924.

EPINEPHELUS INTERSTITIALIS (Poey)

Serranus interstitialis POEY, Memorias sobre la historia natural de la isla de Cuba, vol. 2, p. 127, 1860 (Cuba).

Epinephelus (Mycteroperca) interstitialis METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 51, fig. 19, 1919 (Guanta, Venezuela).

EPINEPHELUS ADSCENSIONIS (Osbeck)

MERO CABRILLA

Trachinus adscensionis OSBECK, Reise nach Ostindien und China, p. 388, 1765 (Ascension Island) (ref. copied).

Epinephelus adscensionis RÖHL, Fauna descriptiva de Venezuela, p. 402, fig. 217, 1942 (coast of Venezuela).

U.S.N.M. No. 123133, 1 specimen, 104 mm., Point Macolla, U. S. S. *Niagara*, April 19, 1925.

EPINEPHELUS STRIATUS (Bloch)

MERO GALLINA

Anthias striatus BLOCH, Naturgeschichte ausländischen Fische, vol. 6, p. 92, pl. 324, 1792 (Atlantic Ocean) (ref. copied).

Epinephelus striatus RÖHL, Fauna descriptiva de Venezuela, p. 403, 1942 (coast of Venezuela).

Genus PROMICROPS Poey

Promicrops POEY, Synopsis piscium cubensium, p. 287, 1868. (Genotype, *Serranus guasa* Poey.)

PROMICROPS ITAJARA (Lichtenstein)

MERO BRASIL

Serranus itajara LICHTENSTEIN, Abh. Akad. Wiss. Berlin, 1821, p. 278 (Brazil) (ref. copied).

Promicrops itajara RÖHL, Fauna descriptiva de Venezuela, p. 402, 1942 (coast of Venezuela).

Genus CEPHALOPHOLIS Bloch and Schneider

Cephalopholis BLOCH and SCHNEIDER, Systema ichthyologiae, p. 311, 1801. (Genotype, *Cephalopholis argus* Bloch.)

CEPHALOPHOLIS FULVUS (Linnaeus)

MULATO

Labrus fulvus LINNAEUS, Systema naturae, ed. 10, p. 287, 1758 (Bahamas).

Cephalopholis fulvus RÖHL, Fauna descriptiva de Venezuela, p. 404, 1942 (coast of Venezuela).

Cephalopholis fulvus punctatus TORTONESE, Bol. Mus. Zool. Anat. Comp. Univ. Torino, vol. 47, No. 89, p. 52, 1939 (Puerto Cabello, Venezuela).

Family PRIACANTHIDAE: Big-eyes

Genus PRIACANTHUS Oken

Priacanthus OKEN, Isis, p. 1782 [=1182], 1817. (Genotype, *Anthias macrophthalmus* Bloch.)

PRIACANTHUS ARENATUS Cuvier and Valenciennes

Priacanthus arenatus CUVIER and VALENCIENNES, Histoire naturelle des poissons, vol. 3, p. 97, 1829 (Brazil; Atlantic).—RÖHL, Fauna descriptiva de Venezuela, p. 404, 1942 (coast of Venezuela).

Family POMATOMIDAE

Genus POMATOMUS Lacepède

Pomatomus LACEPÈDE, Histoire naturelle des poissons, vol. 4, p. 435, 1802. (Genotype, *Pomatomus skib* Lacepède = *Perca saltatrix* Linnaeus.)

POMATOMUS SALTATRIX (Linnaeus)**PEZ AZUL**

Perca saltatrix LINNAEUS, Systema naturae, ed. 10, p. 293, 1758 (America).

Temnodon saltator METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 125, 1919 (Carúpano, Venezuela).

Pomatomus saltatrix RÖHL, Fauna descriptiva de Venezuela, p. 399, 1942 (coast of Venezuela).

The following collections were made by the U. S. S. *Niagara* in the Gulf of Venezuela:

U.S.N.M. No. 123046, 1 specimen, 75 mm. in standard length, Point Macolla, April 19, 1925.

U.S.N.M. No. 123047, 2 specimens, 112 and 125 mm., Salinas Bay, April 5, 1925.

U.S.N.M. No. 123048, 2 specimens, 84 to 266 mm., Piedras Bay, March 14, 1925.

U.S.N.M. No. 123045, 1 specimen, 132 mm., Cape San Román, April 2, 1925.

U.S.N.M. No. 123117, 1 specimen, 515 mm., Salinas Point, December 18, 1924.

Family RACHYCENTRIDAE**Genus RACHYCENTRON Kaup**

Rachycentron KAUP, Isis, vol. 19, p. 89, 1826. (Genotype, *Rachycentron typus* Kaup.)

RACHYCENTRON CANADUS (Linnaeus)**SERGEANTFISH; CRABEATER**

Gasterosteus canadus LINNAEUS, Systema naturae, ed. 12, p. 491, 1766 (Carolina).

U.S.N.M. No. 123064, a large specimen, from the south coast of the Gulf of Venezuela, U. S. S. *Niagara*, November 8, 1924.

Family CARANGIDAE: Pampanos

The material representing this family from Venezuela is rather scanty. A few genera that are to be expected in Venezuelan waters do not occur in the national collection, but undoubtedly they will be taken when adequate collections are made. I am copying Meek and Hildebrand's "Key to the Genera" of this family from "The Marine Fishes of Panama," part 2, pp. 332-333, 1925. This key, however, has been somewhat modified and more or less restricted to cover the Venezuelan coastal waters.

1a. Lateral line wholly or in part armed with bony scutes (very weak and occasionally wanting in *Chloroscombrus*).

2a. Dorsal and anal each with a single detached finlet (see also *Elagatis*); dorsal rays VII or VIII, 29 to 31, 1; anal II-I, 25 to 27, 1; lateral scutes 35 to 42.....**Decapterus**¹⁷ Bleeker

2b. Dorsal and anal without finlets.

3a. Shoulder girdle with a deep furrow near its juncture with the isthmus, and a fleshy projection above it; eye large; dorsal rays VIII-I, 23 to 26; anal II-I, 20 to 23; about 23 to 27 gill rakers on lower limb of first gill arch.....**Trachurops** Gill

3b. Shoulder girdle normal, not as above; eye of moderate size.

¹⁷ Not yet reported from Venezuelan waters.

- 4a. Lateral line armed with deep bony scutes for its entire length; last ray of second dorsal and anal enlarged, nearly separate in adult; dorsal rays VII or VIII-I, 29 to 35; anal II-I, 24 to 29.

Trachurus ¹⁷ Rafinesque

- 4b. Lateral line with plates in its straight portion only; last ray of second dorsal and anal not notably enlarged.

- 5a. Maxillary very narrow; head small; teeth in jaws in a single close-set series, few or none on vomer, palatines, and tongue; dorsal and anal low; never with salient lobes, each with a conspicuous sheath of scales at base; dorsal rays VII or VIII-I, 26 to 30; anal II-I, 22 to 25-----**Hemicaranx** ¹⁷ Bleeker

- 5b. Maxillary broad; head rather large; teeth, if present, in one or more series or in bands on jaws, never in a single close-set series as above.

- 6a. Teeth uneven, in one or a few series on jaws, persistent; villiform teeth usually present on vomer, palatines and tongue, these deciduous or wanting in some species; dorsal VII or VIII-I, 18 to 28; anal II-I, 15 to 24-----**Caranx** Lacepède

- 6b. Teeth small and even, in a single series, or in villiform bands, on jaws, vomer, tongue, and usually on palatines, at all ages.

- 7a. The back much elevated; the dorsal outline more strongly curved than the ventral.

- 8a. Snout well in advance of the forehead; anterior profile convex; anterior rays of second dorsal and anal filamentous; body strongly ovate in young, somewhat elongate in adult, very strongly compressed, the outlines everywhere trenchant; scales very small; dorsal and anal filaments long, extremely long in young; dorsal rays VI-I, 18 to 20; anal II-I, 15 to 17.

Alectis Rafinesque

- 8b. Snout scarcely in advance of forehead; anterior profile nearly vertical; soft dorsal and anal low, never falcate, the anterior rays not produced into filaments; dorsal rays VIII-I, 21 to 24; anal II-I, 17 to 19-----**Vomer** Cuvier

- 7b. The back little elevated; the ventral outline much more strongly curved than the dorsal; lateral line with few very weak bony scutes or none; dorsal rays VIII-I, 26 to 28; anal II-I, 26 to 28; gill rakers slender, close set, 28 to 35 on lower limb of first gill arch-----**Chloroscombrus** Girard

- 1b. Lateral line entirely unarmed.

- 9a. Second dorsal and anal about equal in length, both longer than the abdomen.

- 10a. Body deep, ovate; premaxillaries protractile; second dorsal and anal fins anteriorly elevated, falcate.

- 11a. Body very closely compressed, the outlines everywhere trenchant; preorbital extremely deep; maxillary broad, with a well-developed supplemental bone; dorsal rays VII or VIII-I, 16 to 23; anal II-I, 15 to 20-----**Selene** Lacepède

- 11b. Body less closely compressed, the abdomen never trenchant; preorbital very narrow; maxillary narrow, without a distinct supplemental bone; dorsal rays V to VII-I, 17 to 27; anal II-I, 16 to 24.

Trachinotus Lacepède

- 10b. Body oblong; premaxillaries not protractile, except in very young; maxillary narrow, without a supplementary bone; second dorsal and anal fins low, never falcate; scales embedded, represented by short low

¹⁷ Not yet reported from Venezuelan waters.

ridges set at slightly different angles; dorsal rays IV or V-I, 18 to 21; anal II-I, 18 to 21-----**Oligoplites** Gill

9b. Anal fin much shorter than second dorsal, its base shorter than abdomen.

12a. Dorsal and anal each with a single detached finlet, composed of 2 rays; dorsal rays V or VI-I, 24 to 26-2; anal I or II-I, 16 to 18-2.

Elagatis ¹⁷ Bennett

12b. Dorsal and anal without finlets.

13a. First dorsal with 6 to 8 slender spines, connected by membrane at all ages; lateral line with a long, low arch, forming a slight keel on caudal peduncle in adult; dorsal rays VI to VIII-I, 28 to 36; anal rays I or II-I, 19 to 22-----**Seriola** Cuvier

13b. First dorsal with 3 or 4 low, stiff spines, separate in adult, or connected by a membrane in very young; lateral line scarcely arched, forming a prominent dermal keel on caudal peduncle; dorsal rays III or IV-I, 26 to 28; anal rays II-I, 15 or 16.

Naucrates Rafinesque

Genus TRACHUOPS Gill

Trachurops GILL, Proc. Acad. Nat. Sci. Philadelphia, vol. 14, pp. 238, 261, 431, 1862. (Genotype, *Scomber crumenophthalmus* Bloch.)

TRACHUOPS CRUMENOPHTHALMA (Bloch)

BIG-EYED SCAD; CHICHARRO

Scomber crumenophthalmus BLOCH, Naturgeschichte ausländischen Fische, vol. 7, p. 77, 1793 (Acara in Guinea) (ref. copied.)

Caranx (*Trachurops*) *crumenophthalmus* METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies, 1904-1905, p. 119, 1919 (La Guaira, Venezuela).

Genus CARANX Lacepède

Caranx LACEPÈDE, Histoire naturelle des poissons, vol. 3, p. 57, 1802. (Genotype, *Scomber carangus* Bloch=*Caranx hippos* Linnaeus.)

The three species of *Caranx* so far recorded from Venezuelan waters may be separated by means of the following key:

1a. Arch of lateral line usually shorter than straight portion, or about of same length; gill rakers about 13 to 18, omitting rudiments, on lower part of first gill arch.

2a. Breast naked, except for a small triangular patch of scales just in front of pelvics; a large opercular dark spot present; gill rakers 13 to 15, omitting rudiments, on lower part of first gill arch; lateral line scutes 25 to 40; second dorsal and anal fins with none or with a few scales in addition to the basal sheath; dorsal rays VII or VIII-I, 18 to 21; anal II-I, 16 or 17-----**Caranx hippos** (Linnaeus)

2b. Breast covered with small scales; a small dark opercular spot; gill rakers 13 or 14, omitting rudiments, on lower part of first arch; dorsal and anal with sheath of scales only at base; lateral line scutes 35 to 38; dorsal rays VIII-I, 20 to 22; anal II-I, 17 or 18-----**Caranx latus** Agassiz

1b. Gill rakers about 24 or 25, omitting rudiments, on lower part of first gill arch; depth of body 2.8 to 3.0; mouth 2.3 to 2.5 in head; second dorsal and anal completely covered with minute scales; dorsal rays VIII-I, 23 to 25; anal II-I, 19 or 20; lateral scutes 40 to 50; breast scaly.

Caranx crysos (Mitchill)

¹⁷ Not yet reported from Venezuelan waters.

CARANX HIPPOS (Linnaeus)

JUREL

Scomber hippos LINNAEUS, *Systema naturae*, ed. 12, p. 494, 1766 (Charleston, S. C.) (ref. copied).

Caranx hippos RÖHL, *Fauna descriptiva de Venezuela*, p. 398, fig. 210, 1942 (coast of Venezuela).

U.S.N.M. No. 121801, 10 specimens, 143 to 202 mm., market at Maracaibo, probably caught in Gulf of Venezuela, May 15-19, 1942.

The following collections were made by the U. S. S. *Niagara* in the Gulf of Venezuela:

U.S.N.M. No. 123040, 1 specimen, 155 mm., February 20, 1925.

U.S.N.M. No. 123041, 2 specimens, 40 mm., Point Macolla, April 19, 1925.

U.S.N.M. No. 123042, 4 specimens, 36 to 38 mm., Amuay Bay, December 9, 1924.

U.S.N.M. No. 123043, 11 specimens, 41 to 66 mm., Cape San Román, April 2, 1925.

CARANX LATUS Agassiz

Caranx latus AGASSIZ, in Spix and Agassiz, *Selecta genera et species piscium*. . . *Brasiliam*. . ., p. 105, pl. 56b, fig. 1, pl. E, 1831 (Atlantic).

U.S.N.M. No. 121800, 1 specimen, 184 mm., market at Maracaibo, May 15, 1942.

1 specimen, 51 mm., Río Mamo, 15 km. west of La Guaira, F. F. Bond, November 11, 1938.

1 specimen, 45.5 mm., Río Cumboto, near mouth, 2 km. northwest of Ocumare, F. F. Bond, May 5, 1939.

The following collections were made by the U. S. S. *Niagara* in the Gulf of Venezuela:

U.S.N.M. No. 123058, 1 specimen, 205 mm., Amuay Bay, May 15, 1925.

U.S.N.M. No. 123060, 4 specimens, 50 to 70 mm., Cape San Román, April 2, 1925.

U.S.N.M. No. 123059, 5 specimens, 39 to 93 mm., Amuay Bay, December 9, 1924.

U.S.N.M. No. 123061, 2 specimens, 50 and 53.5 mm., Estanques Bay, February 20, 1925.

CARANX CRYOS (Mitchill)

Scomber crysos MITCHILL, *Trans. Lit. Philos. Soc. New York*, vol. 1, p. 424, 1814 (New York).

U.S.N.M. No. 123039, 1 specimen, 178 mm., Estanques Bay, U. S. S. *Niagara*, December 8, 1924.

Genus VOMER Cuvier

Vomer CUVIER, *Le règne animal*, vol. 2, p. 316, 1817. (Genotype, *Vomer brownii* Cuvier.) (Ref. copied.)

VOMER SETAPINNIS (Mitchill)

Zeus setapinnis MITCHILL, *Trans. Lit. Philos. Soc. New York*, vol. 1, p. 384, 1814 (New York).

Selene setipinnis METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 123, 1919 (coast of Venezuela).

Genus **CHLOROSCOMBRUS** Girard

Chloroscombrus GIRARD, Proc. Acad. Nat. Sci. Philadelphia, 1859, p. 168. (Genotype, *Seriola cosmopolita* Cuvier and Valenciennes=*Scomber chrysurus* Linnaeus.) (Ref. copied.)

CHLOROSCOMBRUS CHRYSURUS (Linnaeus)

Scomber chrysurus LINNAEUS, Systema naturae, ed. 12, p. 194, 1766 (Charleston, S. C.) (ref. copied).

U.S.N.M. Nos. 123054 to 123056, 3 specimens, 131 to 192 mm., U. S. S. *Niagara* Estanques Bay, December 7-8, 1294.

U.S.N.M. No 123057, 3 specimens, 25.5 to 27 mm., south coast, U. S. S. *Niagara*, November 15, 1925.

Genus **SELENE** Lacepède

Selene LACEPÈDE, Histoire naturelle des poissons, vol. 4, p. 560, 1802. (Genotype, *Selene argentea* Lacepède=*Zeus vomer* Linnaeus.)

SELENE VOMER (Linnaeus)

LAMPAROSA O PEZ LUNA

Zeus vomer LINNAEUS, Systema naturae, ed. 10, p. 266, 1758 (America).

Selene vomer RÖHL, Fauna descriptiva de Venezuela, p. 398, fig. 212, 1942 (Coast of Venezuela).

The following collections were made by the U. S. S. *Niagara* in the Gulf of Venezuela in 1925:

U.S.N.M. No. 123053, one specimen, 79 mm., Cape San Román, April 2.

U.S.N.M. No. 123050, one specimen, 49 mm., Jacuque Point, January 26.

U.S.N.M. No. 123049, one specimen, 32 mm., Point Macolla, April 19.

U.S.N.M. No. 123051, one specimen, 135 mm., Gulf of Venezuela, February 20.

U.S.N.M. No. 123052, one specimen, 138 mm., Piedras Bay, March 14.

U.S.N.M. No. 123063, one specimen, 260 mm., Amuay Bay, May 15.

Genus **TRACHINOTUS** Lacepède

Trachinotus LACEPÈDE, Histoire naturelle des poissons, vol. 3, p. 78, 1802. (Genotype, *Scomber falcatus* Forskål.)

KEY TO THE SPECIES OF TRACHINOTUS REPORTED FROM VENEZUELA

- 1a. Dorsal rays VII, 17 to 21; anal III, 16 to 20; second or soft dorsal and anal fins greatly elongate, falcate anteriorly in adults.
- 2a. Depth 1.45 to 1.9; dorsal rays usually VII, 19 to 21; anal III, 17 or 18; gill rakers 9 to 12 on lower part of first arch with 2 or 3 more rudiments; no vertical dark bars on sides-----**Trachinotus falcatus** (Linnaeus)
- 2b. Depth 1.9 to 2.65; dorsal rays usually VII, 19 or 20; anal rays III, 17 or 18; gill rakers on lower limb of first arch 8 to 10 with 2 or 3 more rudiments; sides with 4 or 5 narrow dark crossbars, absent on specimens 75 mm. in standard length-----**Trachinotus glaucus** (Bloch)
- 1b. Dorsal rays usually VII, 23 to 25; anal III, 20 to 23; depth 2.0 to 2.35; gill rakers on lower part of first arch 7 to 9, not including rudiments, usually 3 of latter; anterior rays of soft dorsal and anal fins reaching about to middle of base of fins in adults-----**Trachinotus carolinus** (Linnaeus)

TRACHINOTUS FALCATUS (Linnaeus)

Labrus falcatus LINNAEUS, Systema naturae, ed. 10, p. 284, 1758 (America).

U.S.N.M. No. 121799, 1 specimen, 25.5 mm., Lago de Maracaibo at Maracaibo Yacht Club, Maracaibo, February 27.

TRACHINOTUS GLAUCUS (Bloch)

PÁMPANO

Chaetodon glaucus BLOCH, Naturgeschichte ausländische Fische, vol. 3, p. 112, pl. 210, 1787 (Martinique) (ref. copied).

Trachinotus glaucus RÖHL, Fauna descriptiva de Venezuela, p. 398, fig. 211, 1942 (coast of Venezuela).

Trachinotus goodei RÖHL, Fauna descriptiva de Venezuela, p. 398, 1942 (coast of Venezuela).

U.S.N.M. No. 123068, 3 specimens, 24 to 84 mm., Cape San Román, U. S. S. Niagara, April 2, 1925.

U.S.N.M. No. 123066, 1 specimen, 36 mm., Estanques Bay, U. S. S. Niagara, February 20, 1925.

U.S.N.M. No. 123069, 7 specimens, 68 to 147 mm., Point Macolla, U. S. S. Niagara, April 19, 1925.

TRACHINOTUS CAROLINUS (Linnaeus)

PÁMPANO

Gasterosteus carolinus LINNAEUS, Systema naturae, ed. 12, p. 490, 1766 (Carolina) (ref. copied).

One specimen, 21.5 mm., Río Mamo, 15 km. west of La Guaira, F. F. Bond, October 11, 1938.

U.S.N.M. No. 123071, 7 specimens, 21 to 66 mm., Piedras Bay, U. S. S. Niagara, March 14, 1925.

U.S.N.M. No. 123070, 2 specimens, 17.5 to 21.5 mm., south coast of Gulf, U. S. S. Niagara, November 15, 1925.

Genus OLIGOPLITES Gill

LEATHERJACKETS

Oligoplites GILL, Proc. Acad. Nat. Sci. Philadelphia, 1863, p. 166. (Genotype, *Oligoplites inornatus* Gill.)

In an attempt to determine what name should be applied to the *Oligoplites* inhabiting Lago de Maracaibo I made a study of nearly all the specimens of this genus in the United States National Museum. My results were published (Schultz, 1945d) and it is not deemed necessary to repeat them here. In all, seven species were recognized, three in the Atlantic and four in the Pacific, all in American waters.

KEY TO THE SPECIES OF OLIGOPLITES FROM THE WESTERN ATLANTIC

- 1a. Number of gill rakers on first arch, including rudiments, 5 to 7 + 16 to 20; premaxillary with a single row of short conical teeth along its entire length, except in young this row is irregular or nearly in two rows anteriorly at front of snout: teeth on dentary in two distinct rows; dorsal rays IV-I, 20 or 21; depth 3 to 3.4; head 1.3 in young, 1.4 to 1.6 in adults; posterior margin of maxillary more or less truncate.....*Oligoplites saliens* (Bloch)

- 1b. Number of gill rakers on first arch, including rudiments, 4 to 6 + 1 + 12 to 14.
- 2a. Premaxillary with a band of villiformlike teeth along its entire length, posteriorly narrow, but anteriorly wide, consisting of several rows; teeth on dentary becoming a band anteriorly; dorsal rays IV-I, 19 to 21, rarely with V free spines; depth 3.4 to 3.8; head in greatest depth of body 1.2 to 1.4; posterior tip of maxillary rounded, reaching past orbits in adults; gill rakers on lower limb of first arch 12 or 13.

Oligoplites palometa (Cuvier and Valenciennes)

- 2b. Premaxillary teeth essentially in two distinct rows along its entire length except far posteriorly, where it may become an irregular row, and far anteriorly near tip of snout where a minute row of teeth may occur between the two distinct ones; teeth on dentary in two rows; dorsal rays V-I, 18 to 21, rarely IV or V free spines; depth 3.4 to 4.1; head in greatest depth 1.0 to 1.6; posterior edge of maxillary rounded and usually not reaching past orbits; gill rakers on lower limb of first arch usually 13 or 14, counting rudiments.-----**Oligoplites saurus saurus** (Bloch)

OLIGOPLITES SALIENS (Bloch)

ZAPATERO DE MAR

Scomber saliens BLOCH, Ichthyologie, ou Histoire naturelle des poissons, vol. 10, p. 41, pl. 335, 1797 (Antilles).

I have examined specimens of this species from the Atlantic coast of Central America, Gulf of Venezuela, Trinidad, and Brazil. The following specimens were collected by the U. S. S. *Niagara* in the Gulf of Venezuela:

U.S.N.M. No. 123075, 1 specimen, 84 mm. in standard length, from Amuay Bay, December 9, 1924.

U.S.N.M. No. 123073, 1 specimen, 79 mm., Estanques Bay, February 20, 1925.

U.S.N.M. No. 123074, 1 specimen, 33.5 mm., from south coast, November 15, 1925.

OLIGOPLITES PALOMETA (Cuvier and Valenciennes)

PALOMETA DE LAGO

Chorinemus palometa CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 2, p. 392, 1831 (Lake Maracaibo).

Chorinemus saliens, var. *palometa* GÜNTHER, Catalogue of the fishes in the British Museum, vol. 2, p. 475, 1860 (Lake Maracaibo).

Oligoplites saliens palometa JORDAN AND EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, p. 899, 1896 (Lake Maracaibo).

Oligoplites palometa JORDAN, EVERMANN, AND CLARK, Rep. U. S. Comm. Fish. for 1928, pt. 2, p. 278, 1930 (Lake Maracaibo).

Scombroides palometa REGAN, Biologia Centrali-Americana, Pisces, p. 15, fig., 1908 (Lago Yzabal, Guatemala; Lago de Maracaibo, Venezuela).

U.S.N.M. No. 121804, 4 specimens, 114 to 230 mm., Lago Maracaibo near mouth of Río Concha, May 2, 1942.

U.S.N.M. No. 121805, 2 specimens, 230 and 290 mm., from Río de Los Pájaros, 3 km. above Lago de Maracaibo, April 30, 1942.

U.S.N.M. No. 121803, 1 specimen, 335 mm., from market at Maracaibo, May 15, 1942.

U.S.N.M. No. 121806, 1 specimen, 123 mm., from Lago de Maracaibo at Yacht Club, Maracaibo, May 16, 1942.

U.S.N.M. No. 123072, 1 specimen, 24 mm., south coast of Gulf of Venezuela, U. S. S. *Niagara*, November 15, 1925.

The specimens from the mouth of the Río de Los Pájaros had been feeding on anchovies.

OLIGOPLITES SAURUS SAURUS (Bloch and Schneider)

ZAPATERO

Scomber saurus BLOCH AND SCHNEIDER, *Systema ichthyologiae*, p. 32, 1801 (Jamaica).

Oligoplites saurus RÖHL, *Fauna descriptiva de Venezuela*, p. 399, fig. 213, 1942 (coast of Venezuela).

U.S.N.M. No. 123077, 1 specimen, 86 mm., from Salinas Bay, U. S. S. *Niagara*, April 4, 1925.

U.S.N.M. No. 123078, 1 specimen, 128 mm., from Amuay Bay, U. S. S. *Niagara*, December 9, 1924.

U.S.N.M. No. 123076, 3 specimens, 69 to 74 mm., from Estanques Bay, U. S. S. *Niagara*, February 20, 1925.

Genus SERIOLA Cuvier

Seriola CUVIER, *Le règne animal*, vol. 2, p. 315, 1817. (Genotype, *Caranx dumerili* Risso.) (Ref. copied.)

SERIOLA DUMERILI (Risso)

Caranx dumerili RISSO, *Ichthyologie de Nice*, p. 175, pl. 6, fig. 20, 1810 (Nice).

Seriola dumerili RÖHL, *Fauna descriptiva de Venezuela*, p. 400, 1942 (coast of Venezuela).

Genus NAUCRATES Rafinesque

Naucrates RAFINESQUE, *Caratteri di alcuni nuovi generi e nuove specie di animali Sicilia*, p. 43, 1810. (Genotype, *Naucrates fanfarus* Rafinesque = *Gasterosteus ductor* Linnaeus.) (Ref. copied.)

NAUCRATES DUCTOR (Linnaeus)

PILOTFISH; PILOTO

Gasterosteus ductor LINNAEUS, *Systema naturae*, ed. 10, p. 295, 1758.

Naucrates ductor RÖHL, *Fauna descriptiva de Venezuela*, p. 400, 1942 (coast of Venezuela).

Family CORYPHAENIDAE

DOLPHINS; DORADO

Genus CORYPHAENA Linnaeus

Coryphaena LINNAEUS, *Systema naturae*, ed. 10, p. 261, 1758. (Genotype, *Coryphaena hippurus* Linnaeus.)

CORYPHAENA HIPPURUS Linnaeus

Coryphaena hippurus LINNAEUS, *Systema naturae*, ed. 10, p. 261, 1758 (open seas).—RÖHL, *Fauna descriptiva de Venezuela*, p. 400, fig. 214, 1942 (coast of Venezuela).

Family LUTJANIDAE: Snappers; Pargos

This family is represented by so few species and specimens from Venezuela that it is not practicable to make a key. Instead, the reader is referred to volume 2, p. 491, 1925, of Meek and Hildebrand's "The Marine Fishes of Panama" for a key to the genera of the Lutjanidae likely to occur in Venezuela.

Genus LUTJANUS Bloch

Lutjanus BLOCH, Naturgeschichte der ausländischen Fische, vol. 4, p. 107, 1790.
(Genotype, *Lutjanus lutjanus* Bloch.)

LUTJANUS GUTTATUS (Steindachner)

Mesoprion guttatus STEINDACHNER, Sitzb. Akad. Wiss. Wien, vol. 60, p. 18, pl. 8, 1869 (Mazatlán).

The following specimen, collected by the U. S. S. *Niagara* in the Gulf of Venezuela, is referred to this species with some uncertainty:

U.S.N.M. No. 123139, a specimen, 48 mm., Amuay Bay, December 9, 1924.

LUTJANUS GRISEUS (Linnaeus)

PARGO DE PIEDRA; AGUADERA; O CABALLEROTE

Labrus griseus LINNAEUS, Systema naturae, ed. 10, p. 283, 1758 (Bahamas).
Lutianus griseus RÖHL, Fauna descriptiva de Venezuela, p. 405, fig. 220, 1942 (coast of Venezuela).

U.S.N.M. No. 123140, 1 specimen, 53.5 mm., Point Macolla, U. S. S. *Niagara*, April 19, 1925.

LUTJANUS JOCU (Bloch and Schneider)

Jocú

Anthias jocu BLOCH AND SCHNEIDER, Systema ichthyologiae, p. 310, 1801 (Cuba).

U.S.N.M. No. 123137, 2 specimens, 70 to 71.5 mm., Point Macolla, U. S. S. *Niagara*, April 19, 1925.

One specimen, 70 mm., Río Borburata at mouth, 3 km. east of Puerto Cabello, F. F. Bond, January 15, 1938.

LUTJANUS APODUS (Walbaum)

CAJI

Perca apoda WALBAUM, Artedi's Bibliotheca ichthyologicae, vol. 3, p. 351, 1792 (ref. copied).

U.S.N.M. No. 123138, a specimen, from Point Macolla, U. S. S. *Niagara*, April 19, 1925.

LUTJANUS SYNAGRIS (Linnaeus)

BIAJAIBA

Sparus synagris LINNAEUS, Systema naturae, ed. 10, p. 280, 1758 (Bahamas).
Lutianus [s]aynagris RÖHL, Fauna descriptiva de Venezuela, p. 404, 1942 (coast of Venezuela).

Mesoprion uninotatus GÜNTHER, Catalogue of the fishes in the British Museum, vol. 1, p. 202, 1859 (Puerto Cabello).

LUTJANUS AYA (Bloch)

EL PARGO REAL

Bodianus aya BLOCH, Naturgeschichte der ausländischen Fische, pt. 4, p. 45, pl. 227, 1790 (Brazil).

Lutianus aya RÖHL, Fauna descriptiva de Venezuela, p. 405, fig. 219, 1942 (coast of Venezuela).

LUTJANUS ANALIS (Cuvier and Valenciennes)

PARGO SEBADAL O CEIBADAL

Mesoprion analis CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 2, p. 452, 1828 (San Domingo).

Lutianus analis RÖHL, Fauna descriptiva de Venezuela, p. 405, fig. 221, 1942 (coast of Venezuela).

U.S.N.M.No. 123141, 8 specimens, 52.5 to 156 mm., Point Macolla, U. S. S. Niagara, April 19, 1925.

Genus RHOMBOPLITES Gill

Rhomboplites GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 236. (Genotype, *Centropristes aurorubens* Cuvier and Valenciennes.)

RHOMBOPLITES AURORUBENS (Cuvier and Valenciennes)

PARGO GUACHINANGO O MAL NOMBRE

Centropristes aurorubens CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 3, p. 45, 1829 (Brazil; Martinique; San Domingo).

Rhomboplites aurorubens RÖHL, Fauna descriptiva de Venezuela, p. 406, fig. 222, 1942 (coast of Venezuela).

Genus OCYURUS Gill

Ocyurus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 236. (Genotype, *Sparus chrysurus* Bloch.)

OCYURUS CHRYSURUS (Bloch)

RABIRUBIA

Sparus chrysurus BLOCH, Naturgeschichte ausländischen Fische, vol. 5, p. 28, pl. 262, 1791 (Brazil) (ref. copied).—RÖHL, Fauna descriptiva de Venezuela, p. 406, 1942 (coast of Venezuela).

Family EMMELICHTHYIDAE

Genus INERMIA Poey

Inermia POEY, Memorias sobre la historia natural de la isla de Cuba, vol. 2, p. 193, 1860. (Genotype, *Inermia vittata* Poey.)

INERMIA VITTATA Poey

Inermia vittata POEY, Memorias sobre la historia natural de la isla de Cuba, vol. 2, p. 193, pl. 14, fig. 3, 1860 (Cuba).—JORDAN, EVERMANN, and CLARK, Rep. U. S. Comm. Fish. for 1923, pt. 2, p. 340, 1930 (Venezuela), probably based on Jordan, Copeia, 1922, No. 106, p. 34 (Curaçao).

In my revision of the family Emmelichthyidae (Schultz, 1945b) I described a new genus and species from the Bahamas.

Family POMADASYIDAE: Grunts; Roncos

KEY TO GENERA REPORTED FROM VENEZUELA

- 1a. Gill membranes broadly connected across the isthmus, with a free fold; 2 pairs of pores on chin; preopercle serrate, with 2 spines at lower angle a little enlarged; no spines directed forward; snout short; lower jaw a little shorter than upper, mouth short; preorbital very narrow, about 3 times in eye; dorsal with shallow notch between spiny and soft portions; soft rays of dorsal and anal fins with a basal sheath of scales but no scales on interradial membranes or on rays; depth about 2 and head $3\frac{1}{2}$; dorsal rays XIII, 12; anal III, 10.-----**Genyatremus** Gill
- 1b. Gill membranes narrowly connected forward across apex of isthmus, forming a more or less acute angle, with a narrow free fold; on chin, one pair of pores behind which is a median pore.
- 2a. Soft rays of dorsal and anal fins without scales on interrarial membranes or on rays except the sheath of scales along base of these fins.
- 3a. Preopercle strongly serrate with 2 or 3 spines somewhat enlarged at lower angle; second anal spine enlarged; lower jaw a little shorter than upper; dorsal fin notched nearly to base between spiny and soft portions; preorbital width about two-thirds of or equal to eye; dorsal rays XI to XIV, 11 to 15; anal III, 6 to 8.-----**Pomadasya** Lacépède
- 3b. Preopercle very finely serrate; second anal spine scarcely larger than third spine; jaws equal; dorsal fin not notched; preorbital wider than or about as wide as eye; depth 2.5, head about 3; dorsal rays XII or XIII, 12 to 17; anal III, 9 to 13.-----**Orthopristis** Girard
- 2b. Soft rays of dorsal and anal fins with scales on interrarial membranes in addition to the basal sheath of scales; second anal spine enlarged; dorsal fins deeply notched nearly to base between spiny and soft parts.
- 4a. Preopercle strongly serrate with one or two enlarged spines at lower angle and the serrae along ventral edge directed forward, at least on adults; lower jaw a little longer than upper jaw; depth about 3.4; head about 3; dorsal rays XII, 12 or 13; anal III, 8.-----**Conodon** Cuvier
- 4b. Preopercle serrate but no spines enlarged and none directed forward; lower jaws slightly shorter than upper jaw; depth about 2.4; head 2.8; dorsal rays XI to XIII, 13 to 18; anal III, 8 to 10.
- Anisotremus** Gill
- 2c. Soft rays of dorsal and anal fins profusely covered with scales.
- 5a. Second and third anal spines about equally enlarged; preopercular edge serrate; lower jaw about equal to upper jaw; preorbital width not as wide as eye.
- 6a. A shallow depression between spiny and soft part of dorsal fin; base of caudal fin with a black spot, extending a little on caudal peduncle; depth about 2.8 to 3; head about 2.8; dorsal spines XIII, 13 to 15; anal III, 8 or 9.-----**Bathystoma** Seudder
- 6b. Dorsal fin with a deep notch, nearly to base, between spiny and soft parts; base of caudal fin without a black spot; depth about 2.9 to 3.25; head about 3 to 3.25; dorsal rays XII, 13; anal III, 9 to 10.
- Brachygenys** ¹⁸ Seudder
- 5b. Second anal spine greatly enlarged; preopercle weakly serrate; lower jaw a little shorter than upper jaw; preorbital as wide as or wider than eye; dorsal fin notched nearly to base; back elevated; dorsal rays XI or XII, 14 to 17; anal III, 7 to 9; lips usually thick.-----**Haemulon** Cuvier

¹⁸ Not yet reported from Venezuela although found on both sides.

Genus GENYATREMUS Gill

Genyatremus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 256. (Genotype, *Diagramma cavifrons* Cuvier and Valenciennes=*Lutjanus luteus* Bloch.)

GENYATREMUS LUTEUS (Bloch)

Lutjanus luteus BLOCH, Ichthyologie, ou Histoire naturelle des . . . poissons, vol. 7, p. 89, pl. 247, 1797.

U.S.N.M. No. 121808, a specimen, 213 mm. in standard length, from market at Maracaibo, May 15, 1942.

U.S.N.M. No. 121807, a specimen, 112 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

This characteristic genus and species in general resembles *Anisotremus* but differs in the very narrow preorbital, its least depth is contained about 3 times in the eye and 9 times in the head; in addition the gill membranes form a broad fold across the isthmus as in the Kyphosidae, but the gill membranes are naked. In *Anisotremus* the posterior edge of the gill membranes form an acute angle over the isthmus, and in *Genyatremus* this is evenly curved. There are no scales on the soft rays or membranes of the dorsal and anal fins, only a sheath of scales basally, in *Genyatremus*, whereas in *Anisotremus* the median fins are scaled wholly or in part, always some scales on the interradi al membranes. The dorsal rays are XIII, 12 and anal III, 10 in both specimens from Venezuela. The pectoral fins are equal in length in the distance from the nostrils to rear of head. The margins of the dorsal fins are blackish; there is some indication of a dark, wide, wedge-shaped saddle in front of the dorsal fin, and another over the region of the orbits, both barely discernible in the alcoholic specimens.

Genus POMADASYS Lacepède

Pomadasys LACEPÈDE, Histoire naturelle des poissons, vol. 4, p. 515, 1802. (Genotype, *Sciaena argentea* Förskal.)

POMADASYS CROCRO (Cuvier and Valenciennes)

Pristipoma crocro CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 5, p. 264, 1830 (Martinique).

The identification is not certain because of small size and lack of intermediate sizes.

6 specimens, 21 to 33 mm., Río Guaiguaza, 3 km. west of Puerto Cabello, F. F. Bond, January 15, 1938.

1 specimen, 22 mm., Río Mamo, 15 km. west of La Guaira, F. F. Bond, November 11, 1938.

Genus ORTHOPRISTIS Girard

Orthopristis GIRARD, United States and Mexican boundary survey, Ichthyology, p. 15, 1859. (Genotype, *Orthopristis duplex* Girard=*Perca chrysopterus* Linnaeus.)

ORTHOPRISTIS RUBER (Cuvier)

Pristipoma rubrum CUVIER, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 5, p. 283, 1830 (Brazil).

U.S.N.M. No. 123136, 1 specimen, Amuay Bay, U. S. S. *Niagara*, May 15, 1925.

U.S.N.M. No. 123123, 6 specimens, 114 to 158 mm., Estanques Bay, U. S. S. *Niagara*, December 7 to 11, 1924.

I have made the following counts on the specimens listed above: Dorsal rays XII, 14 in one; XII, 15 in four, and XII, 16 in one; anal rays III, 9 in three and III, 10 in three; gill rakers on lower limb of first gill arch number 11 in three and 12 in one, the raker at the angle not included and the upper part of the arch has about 10 rakers. There are 9 or 10 scales from lateral line to base of first dorsal spine and a more or less distinct dark shoulder blotch.

Genus CONODON Cuvier

Conodon CUVIER, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 5, p. 156, 1830. (Genotype, *Conodon antillanus* Cuvier=*Perca nobilis* Linnaeus.)

CONODON NOBILIS (Linnaeus)

Perca nobilis LINNAEUS, Systema naturae, ed. 10, p. 191, 1758 (North America).

U.S.N.M. No. 123119, 1 specimen, 65 mm. in standard length, Point Macolla, U. S. S. *Niagara*, April 19, 1925.

U.S.N.M. No. 123118, 1 specimen, 270 mm., Estanques Bay, U. S. S. *Niagara*, December 7, 1924.

U.S.N.M. No. 123120, 1 specimen, 54 mm., Cape San Román, U. S. S. *Niagara*, April 2, 1925.

Genus ANISOTREMUS Gill

Anisotremus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1861, pp. 32, 105. (Genotype, *Pristipoma rodo* Cuvier and Valenciennes=*Sparus virginicus* Linnaeus.)

ANISOTREMUS SURINAMENSIS (Bloch)

Lutjanus surinamensis BLOCH, Naturgeschichte der ausländischen Fische, vol. 5, p. 3, pl. 253, 1791 (Surinam) (ref. copied).

U.S.N.M. No. 123121, a specimen, 235 mm. in standard length, from Amuay Bay, U. S. S. *Niagara*, May 15, 1925.

Genus BATHYSTOMA Scudder

Bathystoma SCUDDER, in Putnam, Bull. Mus. Comp. Zool., vol. 1, p. 12, 1863. (Genotype, *Perca melanura* Linnaeus=*Haemulon jeniquano* Poey.) (Ref. copied.)

BATHYSTOMA RIMATOR (Jordan and Swain)

Haemulon rimator JORDAN AND SWAIN, Proc. U. S. Nat. Mus., vol. 7, p. 308, 1884 (Charleston, S. C.; Key West and Pensacola, Fla.).

Haemulon (Bathystoma) rimator METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies in 1904-1905, p. 81, 1919 (Puerto Cabello, Venezuela).

Genus HAEMULON Cuvier

Haemulon CUVIER, Le règne animal, ed. 2, vol. 2, p. 175, 1829. (Genotype, *Haemulon elegans* Cuvier=*Sparus sciurus* Shaw.) (Ref. copied.)

A more complete key to the species of *Haemulon* likely to occur in Venezuela will be found in volume 2 of Meek and Hildebrand's "The Marine Fishes of Panama."

KEY TO THE SPECIES OF HAEMULON REPORTED FROM VENEZUELA

- 1a. Scales below lateral line enlarged, very deep; sides with yellow stripes, parallel with lateral line above it, very oblique below it; dorsal rays XII, 14 or 15; anal III, 7 or 8; scales 47 to 53.—*Haemulon flavolineatum* (Desmarest)
- 1b. Scales below lateral line not notably enlarged; 5 or more scales between lateral line and dorsal origin.
 - 2a. Maxillary reaching to below middle of eye or nearly so, 1.8 to 2½ in head; gill rakers on lower part of first gill arch 16 to 18; head and body with about 10 lengthwise blue stripes (pale in alcohol) usually best defined on snout and cheeks; soft dorsal with convex margin; dorsal rays XII, 16 or 17; anal III, 8 or 9; scales 48 to 57.—*Haemulon sciurus* (Shaw)
 - 2b. Maxillary reaching scarcely past anterior margin of eye, about 2 to 2½ in head; sides with stripes following rows of scales.
 - 3a. Rows of scales with pearly gray stripes; caudal spot present; maxillary 2 to 2.1 in head; snout long pointed, 2.5 to 2.8 in head; dorsal rays XII, 15 to 17; anal III, 8 or 9; scales 53 to 62.

Haemulon steindachneri (Jordan and Gilbert)

- 3b. Rows of scales with continuous dark lines, wavy above lateral line; dorsal rays XII, 15 to 17; anal III, 8 or 9; scales 43 to 50.

Haemulon bonariense Cuvier

HAEMULON FLAVOLINEATUM (Desmarest)

COROCORO; AMARILLO

Diabasis flavolineatus DESMAREST, Première decade ichthyologique, p. 35, pl. 2, fig. 1, 1823 (Cuba) (ref. copied).

Haemulon flavolineatum RÖHL, Fauna descriptiva de Venezuela, p. 407, 1942 (coast of Venezuela).

HAEMULON SCIURUS (Shaw)

CACHICOTO

Sparus sciurus SHAW, General zoology, vol. 4, p. 64, 1803 (Antilles; based on *Anthias formosus* Bloch) (ref. copied).

Haemulon sciurus Röhl, Fauna descriptiva de Venezuela, p. 406, fig. 223, 1942 (coast of Venezuela).

HAEMULON STEINDACHNERI (Jordan and Gilbert)

Diabasis steindachneri JORDAN AND GILBERT, Bull. U. S. Fish Comm. for 1881, vol. 1, p. 322, 1882 (Panama; Mazatlán) (ref. copied).

Haemulon steindachneri METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904–1905, p. 79, 1919 (Guanta, Venezuela).

HAEMULON BONARIENSE Cuvier

Haemulon bonariense CUVIER, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 5, p. 234, 1830 (Buenos Aires).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904–1905, p. 77, fig. 25, 1919 (Venezuela).

Family SPARIDAE: Pargos

KEY TO THE GENERA AND SPECIES OF SPARIDAE REPORTED FROM VENEZUELA

- 1a. Front teeth conical or pointed, not incisorlike.
- 2a. Second interhaemal spine enlarged and hollowed anteriorly; preorbital much wider than eye; head 3.25 to 4; depth 2 to 2.2; dorsal rays XII, 12; anal III, 11; scales 50 to 53; about 6 blunt gill rakers on lower limb of first gill arch.....**Calamus calamus** (Cuvier)
- 2b. Second interhaemal spine normal, not swollen and hollow; preorbital as wide as or broader than eye in large adults; depth about $3\frac{1}{4}$; head nearly 4; depth $3\frac{1}{4}$; dorsal rays XII, 11; anal III, 8; scales about 54 to 57; about 9 blunt gill rakers on lower part of first arch...**Pagrus pagrus** (Linnaeus)
- 1b. Teeth at front of jaws broad incisors.
- 3a. A small antrorse spine at origin of dorsal, this spine visible by dissection; no black spot on caudal peduncle; sides barred, often disappearing in adults.
- 4a. Dorsal rays XIII, 11 or 12; anal III, 10 or 11; scales 43 to 48; a black blotch on lateral line below origin of dorsal fin; sides with yellowish stripes; margin of dorsal blackish; sides of body sometimes with traces of dark vertical bars.....**Archosargus unimaculatus** (Bloch)
- 4b. Dorsal rays XII, 12; anal III, 10; scales about 52; no black shoulder spot; 7 persistent dark vertical bars; no lengthwise stripes on sides; pelvic fins blackish.....**Archosargus aries** (Cuvier)
- 3b. No antrorse spine at dorsal origin; a large black blotch on caudal peduncle just behind base of last dorsal ray; dorsal rays XII, 14 or 15; anal III, 13; scales about 56 to 60.....**Diplodus argenteus** (Cuvier)

Genus CALAMUS Swainson

Calamus SWAINSON, The natural history and classification of fishes, vol. 2, p. 221, 1839. (Genotype, *Pagellus calamus* Cuvier and Valenciennes = *Calamus megacephalus* Shaw.) (Ref. copied.)

CALAMUS CALAMUS (Cuvier)

PES DE PLUMA

Pagellus calamus CUVIER, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 6, p. 206, pl. 152, 1830 (Martinique; San Domingo).

Calamus calamus METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 86, 1919 (Puerto Cabello, Venezuela).

Genus PAGRUS Cuvier

BESUGO

Pagrus CUVIER, Règne animal, ed. 1, vol. 2, p. 272, 1817. (Genotype, *Sparus argenteus* Bloch = *Sparus pagrus* Linnaeus.) (Ref. copied.)

PAGRUS PAGRUS (Linnaeus)

Sparus pagrus LINNAEUS, Systema naturae, ed. 10, p. 279, 1758 (southern Europe).

Pagrus vulgaris METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 87, 1919 (coast of Venezuela).

Genus **ARCHOSARGUS** Gill

SARGO

Archosargus GILL, Can. Nat., vol. 2, p. 266, 1865. (Genotype, *Sparus probatocephalus* Walbaum.)

ARCHOSARGUS UNIMACULATUS (Bloch)

Perca unimaculata BLOCH, Naturgeschichte der ausländischen Fische, vol. 6, pl. 308, fig. 1, 1792 (Brazil).

Sargus unimaculatus METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 88, 1919 (Guanta, Venezuela).

U.S.N.M. No. 123126, 2 specimens, 179 and 194 mm. in standard length, Amuay Bay, U. S. S. *Niagara*, May 15, 1925.

U.S.N.M. No. 123125, 1 specimen, 88 mm., Amuay Bay, U. S. S. *Niagara*, December 9, 1924.

U.S.N.M. No. 123124, 1 specimen, 24 mm., Point Macolla, U. S. S. *Niagara*, April 19, 1925.

ARCHOSARGUS ARIES (Cuvier)

SARGO

Sargus aries CUVIER, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 6, p. 58, 1830 (Rio de Janeiro; Lago de Maracaibo).

Archosargus aries JORDAN, EVERMANN, and CLARK, Rep. U. S. Comm. Fisheries, 1928, p. 338, 1930 (Maracaibo).

U.S.N.M. No. 123127, 1 specimen, 227 mm. in standard length, Amuay Bay, U. S. S. *Niagara*, May 15, 1925.

Genus **DIPLODUS** Rafinesque

Diplodus RAFINESQUE, Indice d'ittologia siciliana, p. 54, 1810. (Genotype, *Sparus annularis* Linnaeus.) (Ref. copied.)

DIPLODUS ARGENTEUS (Cuvier)

SARGO

Sargus argenteus CUVIER, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 6, p. 60, 1830 (Brazil).

U.S.N.M. No. 123128, 1 specimen, 218 mm. in standard length, Estanques Bay, U. S. S. *Niagara*, December 11, 1924.

Family **GERRIDAE**: Mojarras; Carpetas

The following abridged key to the genera of Gerridae was extracted from a manuscript on West Indian fishes by Luis René Rivas, of Cuba, through his kindness and with his permission:

- 1a. Preopercular margin entire; second dorsal spine about equal to or shorter than distance between tip of snout and posterior margin of orbit; second anal spine shorter than caudal peduncle, more than 6 in standard length; greatest depth of body 2.3 to 3.3, usually 2.4 to 3.2 in standard length; maxillary usually not quite reaching to vertical from anterior margin of pupil; air bladder ending posteriorly in a median extension, or in a pair of diverticula; anterior interhaemal bone simple, or with a funnel or spoon-shaped cavity.

- 2a. Air bladder ending posteriorly in a median extension reaching backward and downward into a cavity in the anterior interhaemal bone, which is funnel- or spoon-shaped; depressed area over premaxillary processes longer than wide, crossed by scales in front leaving a naked pit behind, or open and narrowly U-shaped and sometimes slightly restricted by scales in front. Sides of body without vertical dark bands.

Eucinostomus Baird and Girard

- 2b. Air bladder ending posteriorly in a pair of diverticula extending backward on each side of the anterior interhaemal bone, which is simple; depressed area over premaxillary processes about as long as wide, always open and broadly U-shaped; sides of body crossed by vertical irregular dark bands.

Gerres Cuvier

- 1b. Preopercular margin serrate; second dorsal spine longer than distance between tip of snout and posterior margin of orbit; second anal spine about equal to or longer than caudal peduncle, less than 6 in standard length; greatest depth of body 1.7 to 2.4, usually 1.8 to 2.3 in standard length; maxillary reaching to or beyond vertical from anterior margin of pupil; air bladder ending bluntly, without posterior diverticulum or median extension; anterior interhaemal bone simple.

- 3a. Sides of body without longitudinal black stripes; preorbital entire; second anal spine shorter than anal base; its length 2.2 to 3.2, usually 2.3 to 3.1 in greatest depth of body; greatest depth of body 1.7 to 2.1, usually 1.8 to 2.0 in standard length; anal base 3.8 to 4.5, usually 3.9 to 4.4 in standard length; last dorsal spine 2.0 to 4.0 in anal base; eye 2.0 to 2.8, usually 2.1 to 2.7 in anal base-----**Diapterus Ranzani**

- 3b. Sides of body with longitudinal black stripes; preorbital serrate except in young; second anal spine longer than anal base, its length 1.4 to 2.4, usually 1.5 to 2.3 in greatest depth of body; greatest depth of body 1.9 to 2.5, usually 2.0 to 2.4 in standard length; anal base 4.5 to 6.0, usually 4.6 to 5.9 in standard length; last dorsal spine 1.4 to 1.9 in anal base; eye 1.4 to 2.1, usually 1.5 to 2.0 in anal base.

Eugerres Jordan and Evermann

Genus EUCINOSTOMUS Baird and Girard

Eucinostomus BAIRD AND GIRARD, in Baird, Rep. Smithsonian Inst. for 1854, p. 334, 1855. (Genotype, *Eucinostomus argenteus* Baird and Girard.) (Ref. copied.)

I am very grateful to Luis René Rivas for the identification of the specimens reported upon under this genus and for permission to print his key to the West Indian species of *Eucinostomus*.

- 1a. Anterior interhaemal bone funnel-shaped; maxillary longer than second anal spine, about equal to or greater than diameter of eye, about equal to or greater than least depth of caudal peduncle; second anal spine more than 2.6 in head, shorter than distance between tip of snout and center of eye; snout about equal to or longer than second anal spine; pectoral fin naked.
- 2a. Funnel-like cavity in anterior interhaemal bone more conspicuous, about 4 times as long as wide, the lateral ridge low and not reaching to lowermost part of edge of funnel; anal rays III, 7; greatest depth of body 2.3 to 3.2, usually 2.4 to 3.1 in standard length.
- 3a. Gill rakers 7 on lower limb of first arch (not counting rudiments or gill raker at angle); maxillary more than 2.3 in distance between posterior tip of premaxillary process and origin of spinous dorsal fin, usually less than perpendicular distance between origin of spinous dorsal fin and

lateral line; posterior tip of premaxillary process not reaching to vertical from center of eye, its length (from tip to snout), 1.8 to 2.4 in distance between its posterior tip and origin of spinous dorsal fin; second anal spine shorter than diameter of eye, more than 3 in distance between posterior tip of premaxillary process and origin of spinous dorsal fin; spinous dorsal fin more or less dusky, but without a jet-black blotch at its tip, or definite whitish or colorless area below it.

- 4a. Greatest depth of body 2.3 to 2.6, usually 2.4 or 2.5 in standard length; head 2.8 to 3.1, usually 2.9 or 3.0 in standard length; the distance between tip of snout and origin of spinous dorsal fin, 2.1 to 2.3, usually 2.2 in standard length; eye 2.7 to 3.1, usually 2.8 to 3.0 in distance between origin of anal fin and caudal base; area over premaxillary processes usually crossed by scales anteriorly leaving a naked area behind. **Eucinostomus gula** (Cuvier and Valenciennes)
- 4b. Greatest depth of body 2.8 to 3.3, usually 2.9 to 3.2 in standard length; head 3.1 to 3.5, usually 3.2 to 3.4 in standard length; the distance between tip of snout and origin of spinous dorsal fin, 2.3 to 2.5, usually 2.4 in standard length; eye 3.1 to 3.6, usually 3.2 to 3.5 in distance between origin of anal fin and caudal base; area over premaxillary processes usually depressed and narrowly U-shaped sometimes slightly restricted by scales anteriorly.

Eucinostomus argenteus Baird and Girard

- 3b. Gill rakers 8 on lower limb of first arch (not counting rudiments or gill raker at angle); maxillary less than 2.3 in distance between posterior tip of premaxillary process and origin of spinous dorsal fin, usually about equal to, or somewhat greater than perpendicular distance between origin of spinous dorsal fin and lateral line; posterior tip of premaxillary process reaching to or somewhat beyond vertical from center of eye, its length (from tip of snout) 1.3 to 1.8 in distance between its posterior tip and origin of spinous dorsal fin; second anal spine equal to or greater than diameter of eye, less than 3 in distance between posterior tip of premaxillary process and origin of spinous dorsal fin; spinous dorsal fin with a conspicuous jet-black blotch at its tip, separated from the basal dusky area by a whitish or colorless area.-----**Eucinostomus pseudogula** Poey
- 2b. Funnel-like cavity in anterior interhaemal bone less conspicuous, more than 4 times as long as wide, the lateral ridge high and reaching beyond lowermost part of edge of funnel; anal rays II, 8; greatest depth of body 3.1 to 3.5, usually 3.2 to 3.4 in standard length.

Eucinostomus lefroyi¹⁹ (Goode)

- 1b. Anterior interhaemal bone spoon-shaped; maxillary shorter than second anal spine, less than diameter of eye, somewhat less than least depth of caudal peduncle; second anal spine less than 2.6 in head, usually about equal to, or slightly longer than distance between tip of snout and center of eye; snout shorter than second anal spine; pectoral fin scaled.

Eucinostomus havana¹⁹ (Nichols)

EUCINOSTOMUS GULA (Cuvier and Valenciennes)

LA MOJARRA

Gerres gula CUVIER AND VALENCIENES, Histoire naturelle des poissons, vol. 6, p. 464, 1830 (Martinique).

Eucinostomus gula RÖHL, Fauna descriptiva de Venezuela, p. 407, 1942 (coast of Venezuela).

¹⁹ Not yet reported from Venezuela.

U.S.N.M. No. 121705, 3 specimens, 47 to 70 mm., from Lago de Maracaibo at Yacht Club, Maracaibo, May 5 and 16, 1942.

U.S.N.M. No. 121706, 2 specimens, 36 and 53 mm., Lago de Maracaibo at Yacht Club, Maracaibo, February 27, 1942.

U.S.N.M. No. 121704, 1 specimen, 68 mm., Lago de Maracaibo, 7 km. south of Maracaibo, March 6, 1942.

U.S.N.M. No. 121703, 14 specimens, 14 to 42 mm., Lago de Maracaibo opposite Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121707, 135 specimens, 28 to 77 mm., Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

The following collections were made by Dr. F. F. Bond:

10 specimens, 13 to 55 mm., coastal lagoons 15 km. north of Maracaibo April 6, 1938.

1 specimen, 53 mm., lagoons, Tucacas, 60 km. northwest of Puerto Cabello, January 29, 1938.

1 specimen, 29 mm., Río Borburata, 3 km. east of Puerto Cabello at Gañanga.

2 specimens, 20 and 23 mm., Río Cerro Grande, 10 km. east of Macuto, December 22, 1937.

EUCINOSTOMUS ARGENTEUS Baird and Girard

MOJARRA

Eucinostomus argenteus BAIRD AND GIRARD, in Baird, Ann. Rep. Smithsonian Inst. for 1854, p. 335, 1855 (Bessley Point, N. J.).

U.S.N.M. No. 121798, 62 specimens, 20 to 67 mm., Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

The following specimens were collected by the U. S. S. *Niagara* in Gulf of Venezuela:

U.S.N.M. No. 121943, 1 specimen, 80 mm. in standard length, Point Macolla, April 19, 1925.

U.S.N.M. No. 121945, 2 specimens, 81 and 87 mm. in standard length, Salinas Bay, April 4-5, 1925.

U.S.N.M. No. 121947, a specimen 89 mm., Estanques Bay, February 20, 1925.

U.S.N.M. No. 121944, 2 specimens, 56 and 67 mm., Amuay Bay, December 9, 1924.

U.S.N.M. No. 121946, 10 specimens, 45.5 to 80 mm., Cape San Román, April 2, 1925.

The following collections were made by Dr. F. F. Bond:

40 specimens, 15 to 27 mm. in standard length, Río Borburata, 3 km. east of Puerto Cabello at Gañanga, January 15, 1938.

9 specimens, 14 to 27 mm., Río Cerro Grande, 10 km. east of Macuto, December 22, 1937.

1 specimen, 19 mm., coastal lagoon 15 km. north of Maracaibo.

1 specimen, 21 mm., Río Apure at San Fernando de Apure, February 16, 1938.

The young of this species and of *E. gula* are separated with considerable difficulty, and I am not positive that my identification of specimens under 25 mm. is correct.

In the Maracaibo Basin specimens, in addition to the difference in depth of body between *E. gula* and *E. argenteus*, I observed that the

tip of the lower jaw or lip was almost invariably without scattered black pigment in *argenteus*, whereas in *gula* the tip of the lip of lower jaw almost always had several black pigment cells somewhat embedded. The character of the area over the premaxillary process and scales meeting in front of this groove is of no value on small specimens. However, specimens from the coast of Venezuela south of the Gulf of Venezuela had their chins pigmented. Thus specimens 25 mm. and shorter can be separated only on their slenderness as compared with those of *gula* which are a little more robust.

EUCINOSTOMUS PSEUDOGULA Poey

Eucinostomus pseudogula POEY, Enumeratio piscium cubensium, p. 53, pl. 1, 1875 (Havana).

7 specimens, 34 to 47 mm., Laguna del Río Capatárida, 5 km. west of Capatárida, F. F. Bond, March 21, 1938.

Genus GERRES Cuvier

Gerres CUVIER, in Quoy and Gaimard, Freycinet, Voyage autour du monde, *L'Uranie et La Physicienne*, Poissons, p. 293, 1824. (Genotype, *Gerres vaigiensis* Quoy and Gaimard.) (Ref. copied.)

GERRES CINEREUS (Walbaum)

Mugil cinereus WALBAUM, Artdi genera piscium, pt. 3, p. 228, 1792 (Bahamas) (ref. copied).

U.S.N.M. No. 121942, 1 specimen, 217 mm. in standard length, Gulf of Venezuela, U. S. S. *Niagara*, February 20, 1925.

1 specimen, 65 mm., from lagoons at Tucacas, 10 km. northwest of Puerto Cabello, F. F. Bond, January 29, 1938.

2 specimens, 36 and 39 mm., Laguna del Río Capatárida at mouth, 5 km. north of Capatárida, F. F. Bond, March 21, 1938.

1 specimen, 47 mm., from baja seco east side of Puerto Cabello, January 26, 1938.

Genus DIAPTERUS Ranzani

Diapterus RANZANI, Novi Comment. Acad. Sci. Inst. Bonon., vol. 4, p. 340, 1840. (Genotype, *Diapterus auratus* Ranzani.)

It is with considerable reluctance that I add two new names to the genera *Diapterus* and *Eugerres* in my study of the Venezuelan forms. These genera have not been revised to my knowledge, and no one has as yet determined the constancy of the number of anal spines in large series of specimens. This should be done when the genera are revised, and then the validity of these new species as well as others may be evaluated. My counts, however, indicate a rather constant number of rays for most of the fins, and there appears to be little variation in the number of scales or gill rakers for any species from one locality.

The following key is based on specimens collected in Venezuelan waters, as well as on other materials in the national collections from the Western Atlantic:

1a. Anal rays III,8.

- 2a. Gill rakers on lower part of gill arch 10 or 11; dusky bars on sides of young but adults with dusky punctulations and no bars; second dorsal spine a little shorter than third, both shorter than head, the second contained nearly 4 times in standard length; second anal spine strong, but a little shorter than third, the second anal spine 1.8 in head and 1.5 in second dorsal spine; area over premaxillary groove free of scales in young but covered with small scales in large specimens.

Diapterus olisthostomus (Goode and Bean)

- 2b. Gill rakers on lower part of first arch 15; second dorsal spine a little shorter than third, the second spine about $1\frac{1}{2}$ in head; second anal spine enlarged, a little longer than third spine, the second 1.5 in head and $1\frac{1}{2}$ in second dorsal spine; second row of scales below lateral line continuous to end of caudal; area over premaxillary processes on top of head free from scales; no dark stripes or distinct bars visible.

Diapterus limnaeus, new species

1b. Anal rays II,i,8 or II,9.

- 3a. Anal rays II,9; gill rakers on lower part of first arch 14 or 15, rarely 16; second dorsal spine a little shorter than third, the second spine contained 1.2 to 1.4 in head and about 3.2 to 3.5 in standard length; second anal spine 1.4 to 1.6 in head and 4 to 4.5 in standard length; second row of scales below lateral line continuous to caudal fin.

Diapterus rhombeus (Cuvier)

- 3b. Anal rays II,i,8: gill rakers 10 or 11 on lower part of first arch; second dorsal spine a little shorter than third, about $1\frac{1}{2}$ to $1\frac{2}{3}$ in head and 3.5 to 3.75 in standard length; second anal spine strong, 1.6 in head and 4.2 in standard length; third row of scales below lateral line continuous to caudal.-----**Diapterus evermanni** Meek and Hildebrand

DIAPTERUS OLISTHOSTOMUS (Goode and Bean)

Gerres olisthostoma GOODE AND BEAN, Proc. U. S. Nat. Mus., vol. 5, p. 423, 1882 (Indian River, Fla.).

U.S.N.M. No. 121941, 1 specimen, 177 mm. in standard length, Amuay Bay, Gulf of Venezuela, U. S. S. *Niagara*, May 15, 1925.

DIAPTERUS LIMNAEUS, new species

FIGURE 16

Holotype.—U.S.N.M. No. 121726, only known specimen, 68 mm. in standard length, collected by Leonard P. Schultz in Lago de Maracaibo at Maracaibo Yacht Club, May 16, 1942.

Description.—Certain measurements were made on the holotype and these are recorded in hundredths of the standard length in table 18.

The following counts were made: Dorsal rays IX,10; anal rays III,8; pectoral rays iii,12-iii,12; scales from upper edge of gill opening to midcaudal fin base 40; scales from base of first soft ray of dorsal to lateral line 4, and 9 from base of first anal spine to lateral line; gill rakers on lower part of first arch 15.

Greatest depth of body 2.2 and head 3, in standard length; snout 3.25, eye about $2\frac{1}{2}$, and postorbital length of head $2\frac{1}{2}$ in length of

head; maxillary reaches to below anterior margin of pupil; area above premaxillary processes broad and free from scales; preorbital edge smooth; posterior margin of preopercle serrate; gill rakers short, strong, on lower part of first arch; second dorsal spine not reaching quite to tip of third; second anal spine strong, reaching past third which is slender; second dorsal spine 1.1 and second anal spine about 1.4 in head; distal margin of dorsal fin concave, that of anal fin a little concave; pectoral fin pointed, the second branched ray longest, and reaching opposite base of third anal spine; third dorsal spine when depressed reaches to opposite base of fourth soft dorsal ray; second anal spine when depressed reaches past base of last anal ray;

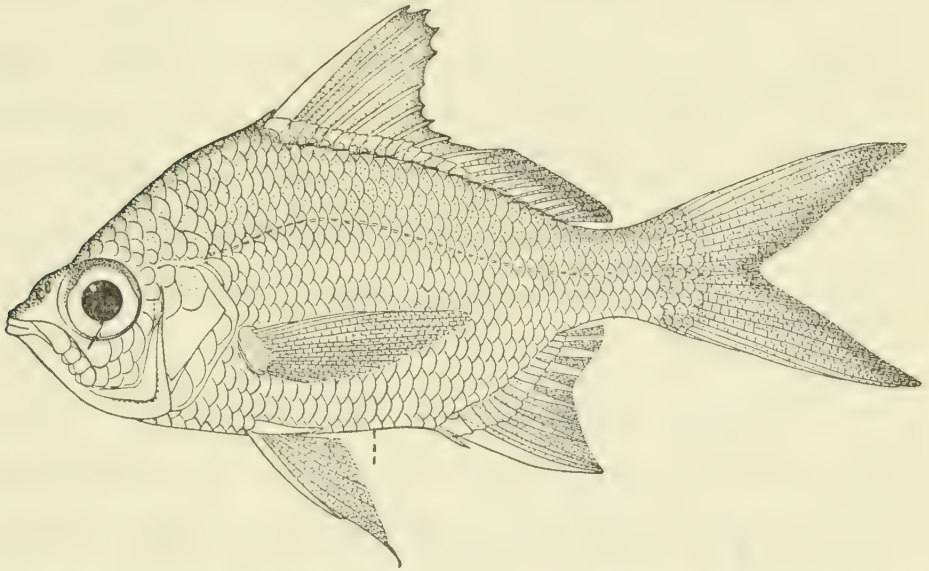


FIGURE 16.—*Diapterus linnaeus*, new species: Holotype (U.S.N.M. No. 121726), 68 mm. in standard length. Drawn by Mrs. Aime M. Awl.

profile of head slightly concave over eyes; first soft ray of pelvics with a short filament, the pelvic spine reaching nearly past anus; second row of scales below lateral line continuous to caudal fin base; greatest depth of body at origin of dorsal fin.

Color.—Plain silvery without dark streaks on sides and no dark bars; distal margin of dorsal fin black edged; a few blackish pigment cells on interradi al membranes of dorsal and anal fins but not forming spots or blotches; tips of rays of caudal fin with a few dark pigment cells.

Remarks.—This new species differs from all others of the genus in the Atlantic as indicated in the key on pages 141 and 142, chiefly in having 15 gill rakers in combination with a smooth preorbital, no scales on area over premaxillary groove, and the second dorsal

spine not reaching quite to tip of third dorsal spine. From *D. peruvianus* of the Pacific with which this new species is most closely related, it differs by having 15 gill rakers instead of 12 or 13.

Named *limnaeus* (meaning "lake") in reference to its occurrence in Lake Maracaibo.

DIAPTERUS RHOMBEUS (Cuvier)

LA CARPETA

Gerres rhombeus CUVIER, La règne animal, vol. 2, ed. 2, p. 188, 1829.

U.S.N.M. No. 121710, 5 specimens, 56.5 to 83 mm. in standard length, from Lago de Maracaibo at Yacht Club, Maracaibo, May 16, 1942.

U.S.N.M. No. 121713, 2 specimens, one 67 mm., the other only anterior part of body and head, Lago de Maracaibo, 1 km. off Pueblo Viejo in gill net, April 7-9, 1942.

U.S.N.M. No. 121712, 5 specimens, 35 to 59 mm., Lago de Maracaibo at Yacht Club, Maracaibo, February 27, 1942.

U.S.N.M. No. 121711, 3 specimens, 43 to 64 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

U.S.N.M. No. 121708, 29 specimens, 36 to 62 mm., Lago de Maracaibo at Yacht Club, Maracaibo, March 5, 1942.

U.S.N.M. No. 121714, 12 specimens, 28 to 43 mm., Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121709, 1 specimen, 20 mm., caño at Los Monitos, Río Limón system, March 11, 1942.

U.S.N.M. No. 121949, 1 specimen, 36 mm., Point Macolla, U. S. S. *Niagara*, April 19, 1925.

U.S.N.M. No. 121948, 6 specimens, 35 to 39 mm., Amuay Bay, U. S. S. *Niagara*, December 9, 1924.

1 specimen, 25 mm., bajo seco east side of Puerto Cabello, F. F. Bond, January 26, 1938.

3 specimens, 40 to 42 mm., Laguna del Río Capatárida at mouth, 5 km. north of Capatárida, F. F. Bond, March 21, 1938.

1 specimen, 22 mm., Laguna de Tacarigua, Estado de Miranda, F. F. Bond, February 3, 1939.

DIAPTERUS EVERMANNI Meek and Hildebrand

Diapterus evermanni MEEK AND HILDERRAND, The marine fishes of Panama, pt. 2, p. 594, pl. 63, 1925 (Mindi River, near Mindi; Fox Bay, Colon, Panama).

3 specimens, 40 to 44.5 mm., Laguna del Río Capatárida at mouth, 5 km. north of Capatárida, F. F. Bond, March 21, 1938.

3 specimens, 47 to 53.5 mm., Laguna de Tacarigua, Estado de Miranda, F. F. Bond, February 3, 1939.

2 specimens, 54 and 55.5 mm., salt-water lagoon on coast, 5 km. west of Cumaná, F. F. Bond, March 25, 1939.

The three collections listed above contain eight specimens in which the anal rays are II,i,8. The type and paratype of *evermanni*, U.S.N.M. Nos. 81738 and 81322, have II,i,8 rays, the third ray simple and with its tip cross striated, indicating that this is a soft ray but unbranched. This species is the counterpart of the four

TABLE 17.—Counts made on species of *Diapterus* and *Eugerres*

Genus and species	Number of fin rays											Number of gill rakers on lower part of first arch											
	Dorsal					Anal						Pectoral											
	VIII, 11	IX, 9	IX, 10	IX, 11	X, 10	II, i, 7	II, i, 8	II, 8	II, 9	III, 7	III, 8	III, 9	iii, 12	iii, 13	iii, 14	iv, 12	10	11	12	13	14	15	16
<i>Diapterus:</i>																							
<i>clathostomus</i>			1								1			2			1						
<i>linnaeus</i>			1								1		2									2	
<i>rhombus</i>			19						35				2	11		3						13	1
<i>evermanni</i>			8	1	1		10						1	2	2		1	7	3				
<i>Eugerres:</i>																							
<i>avulæ</i>		1	4					1	4					3	1						2	2	
<i>brasilianus</i>			2							2			1	2			2						
<i>plumieri</i>	1	1	13			1	3			1	18	1	2	12		1					8	4	

specimens mentioned under *plumieri* that have the third anal ray simple but cross striated.

This modification of the third anal ray has been considered by Meek and Hildebrand as of specific significance, but its occurrence in other species causes me to cast serious doubt on its validity as a dependable character when considered alone. However, in view of the small series of specimens for certain species of *Diapterus*, I am tentatively referring the above listed specimens to *evermanni*.

TABLE 18.—Measurements made on certain species of *Diapterus*. (All measurements expressed in hundredths of the standard length.)

Characters	<i>D. limnaeus</i>	<i>E. awlæ</i>		<i>E. plumieri</i>	
	Holotype	Holotype	Paratype	U.S.N.M. No. 121725	
Standard length in millimeters.....	68	75	79	45.7	43.5
Length of head.....	33.8	36.6	35.4	37.2	37.2
Postorbital length of head.....	14.3	15.7	15.2	15.1	15.4
Diameter of eye.....	12.8	14.0	12.7	13.6	15.4
Length of snout.....	10.3	10.0	10.1	10.1	11.3
Tip of snout to rear of maxillary.....	12.1	13.1	12.0	12.9	13.3
Width of bony interorbital space.....	9.56	9.34	8.98	8.75	8.96
Greatest depth of body.....	44.1	44.7	43.9	39.4	37.9
Least depth of caudal peduncle.....	16.5	19.6	19.7	19.7	18.8
Length of:					
Caudal peduncle.....	12.5	12.0	11.9	11.6	11.5
Longest ray of pectoral.....	33.8	34.0	33.2	28.9	29.0
Longest branched ray of pelvic fins.....	27.9	30.7	27.0	27.8	28.7
Longest branched ray of caudal fin.....	40.4	40.0	41.8	37.6	37.9
Second dorsal spine.....	30.1	44.8	40.6	39.4	39.5
Third dorsal spine.....	30.1	40.1	35.4	32.8	35.6
Second anal spine.....	22.8	36.7	37.3	33.9	34.5
Third anal spine.....	20.0				
Tip of snout to:					
Dorsal origin.....	45.6	48.0	47.4	45.3	45.5
Anal origin.....	67.6	68.0	66.4	66.0	65.3
Pectoral insertion.....	33.8	36.0	35.4	35.4	37.7
Pelvic insertion.....	41.8	40.8	41.0	42.4	43.6
Length of:					
Base of dorsal fin.....	49.2	51.3	51.3	47.0	49.2
Base of anal fin.....	23.5	20.0	22.1	20.8	19.5
Pelvic spine.....	18.7	20.3	19.7	18.6	17.7
Pelvic axillary scale.....	10.3	11.1	7.59	8.30	8.28

Genus EUGERRES Jordan and Evermann

Eugerras JORDAN AND EVERMANN, Proc. California Acad. Sci., ser. 4., vol. 16, p. 506, 1927. (Genotype, *Gerres plumieri* Cuvier and Valenciennes.)

- 1a. Gill rakers on lower part of first arch usually 10; anal rays III,7; second dorsal spine a little shorter than head but a trifle longer than third dorsal spine and about 3.5 in standard length; second anal spine equal to second dorsal spine in length..... *Eugerres brasiliæ*²⁰ (Cuvier and Valenciennes)
- 1b. Gill rakers on lower part of first gill arch usually 14 to 16; second dorsal spine longer than third and longer than head, about 2½ in standard length;

²⁰ Not yet reported from Venezuela.

second anal spine about 1 to 1.1 in head, and 2.75 to 3 in standard length; young with 4 to 7 narrow vertical dusky bars on sides.

2a. Anal rays II,8 or 9.....*Eugerres awlae*, new species

2b. Anal rays II,i,7 or 8 or III,7 to 9.

Eugerres plumieri (Cuvier and Valenciennes)

EUGERRES AWLAE, new species

FIGURE 17

Holotype.—U.S.N.M. No. 121721, a specimen, 74 mm. in standard length, collected by Leonard P. Schultz in the channel of Salina Rica, 5 km. north of Maracaibo, Venezuela, February 20, 1942.

Paratypes.—U.S.N.M. No. 121722, 3 specimens, 37 to 79 mm., taken by Leonard P. Schultz in Lago de Maracaibo opposite Salina Rica, 5 km. north of Maracaibo, February 20, 1942; U.S.N.M. No. 121723, a specimen, 57 mm., collected in Lago de Maracaibo, 7 km. south of Maracaibo, by Leonard P. Schultz on March 6, 1942.

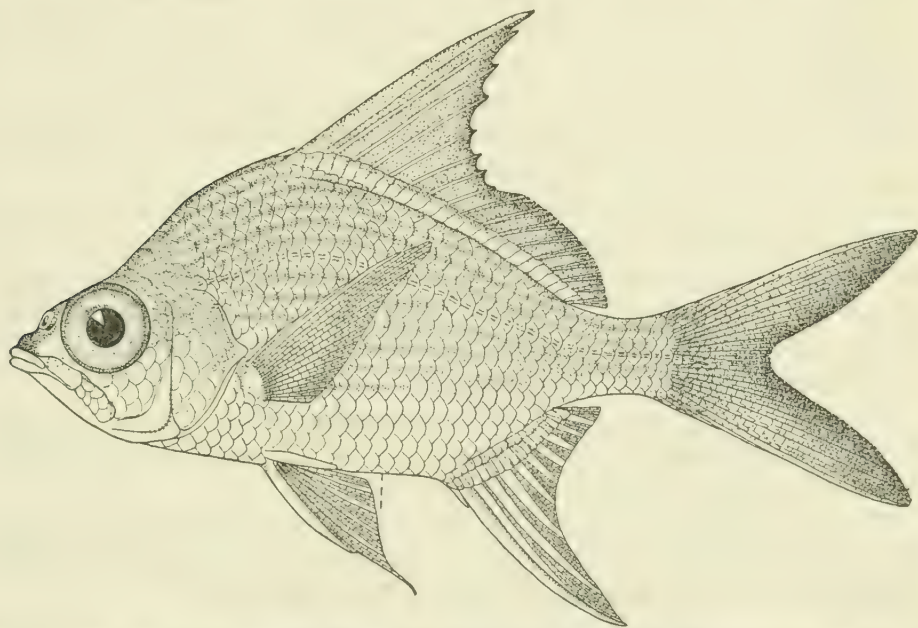


FIGURE 17.—*Eugerres awlae*, new species: Holotype (U.S.N.M. No. 121721), 74 mm. in standard length. Drawn by Mrs. Aime M. Awl.

Description.—Certain measurements were made on the holotype and one paratype and these data are recorded in table 18, expressed in hundredths of the standard length.

The following counts were made, respectively, for the holotype and one paratype, and additional counts are recorded in table 17: Dorsal rays IX,10 (IX,10); anal rays II,9 (II,9); pectoral rays iii,13-iii,13 (iii,13-iii,13); scales 37 (37); scales above lateral line to base of first soft ray of dorsal 4 (4) and below lateral line to origin of anal fin 9

(9); gill rakers on lower half of arch 14 to 15, the most anterior tiny rudiment or two not included.

Greatest depth of body 2.3 to 2.5, head about 2.6 or 2.7 in standard length; snout 3.5 to 3.7, eye 2.7 or 2.8 and postorbital length of head 2.3 or 2.4, all in length of head; maxillary reaches to below anterior margin of pupil; area above premaxillary processes broad and without scales; preorbital edge smooth in young or a little rough or somewhat serrate in adults; rear margin of preopercle serrate; gill rakers strong and short; second dorsal spine long, reaching past third, contained 2.4 to 2.6 in standard length, much longer than length of head, about equal to greatest depth of body; second anal spine long, strong, equals length of head or nearly so; distal margin of dorsal and of anal fins strongly concave; pectoral fin long, pointed, the third branched ray usually longest, reaching to opposite base of first or second soft anal rays; second dorsal spine when depressed reaches to opposite bases of seventh or eighth soft dorsal rays; second anal spine reaches to opposite caudal fin base or a little beyond in the large specimens; profile of head slightly concave over orbits; first soft ray of pelvics with a short filament, the pelvic spine shorter but reaching a little past anus; third row of scales below lateral line continuous to caudal fin; greatest depth of body at origin of dorsal.

Color.—Each row of scales with a dark streak dorsally, but more or less lacking ventrally; margin of dorsal fin blackish distally, rest of fin dusky, except the sheath of scales along the base are white; anal fin dusky, basal sheath of scales white; pelvic fins and caudal fin dusky; pectoral fins pale; top of snout dusky, but lips are white except some black pigment on middorsal part of upper lip.

Remarks.—This new species is separated from other western Atlantic representatives of the genus by the key on page 146. Other minor differences are given in tables 17 and 18.

Named *awlae*, in honor of Mrs. Aime M. Awl, artist, United States National Museum, who has willingly and expertly drawn for me very numerous figures of new fishes over a period of years.

EUGERRES PLUMIERI (Cuvier and Valenciennes)

LA MOJARRA

Gerres plumieri CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 6, p. 452, pl. 167, 1830 (Puerto Rico; Antilles).

U.S.N.M. No. 121720, 7 specimens, 63 to 85 mm. in standard length, from Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121719, a specimen, 123 mm., from Lago de Maracaibo near mouth of Río Concha, May 2, 1942.

U.S.N.M. No. 121717, 5 specimens, 55 to 87 mm., from Lago de Maracaibo, 7 km. south of Maracaibo, March 6, 1942.

U.S.N.M. No. 121716, 4 specimens, 53 to 82 mm., from Lago de Maracaibo at Yacht Club, Maracaibo, May 16, 1942.

U.S.N.M. No. 121715, 10 specimens, 33 to 50 mm., from Lago de Maracaibo at Yacht Club, Maracaibo, February 27, 1942.

U.S.N.M. No. 121718, 6 specimens, 45 to 100 mm., Lago de Maracaibo at Yacht Club, Maracaibo, March 5, 1942.

There are four specimens measuring 37.5 to 51 mm., from Lago de Maracaibo at Yacht Club, Maracaibo, that I have separated from the February 27 collection (U.S.N.M. No. 121715) and I have placed them in a separate jar that bears U.S.N.M. No. 121725. They are referred to this species but vary from it in having II, i, 7 (in one specimen) and II, i, 8 (in three specimens) instead of the usual three anal spines. The third anal ray is usually a small slender spine but in the four specimens under consideration here the third ray is simple with a few cross-striations near its tip. I cannot otherwise distinguish these four specimens from typical specimens of *D. plumieri*.

Should a larger series become available to someone and should these prove to represent an undescribed species, I have carefully measured two specimens and recorded the data in table 18. In addition, the following description was drawn up.

Dorsal rays VIII, 11 (in one) and IX, 10 (in three); pectoral rays IV, 12 in two counts, V, 11 in three, V, 12 in one; gill rakers on lower part of first gill arch 14 or 15 in all four specimens.

Greatest depth of body 2.5 or 2.6, head 2.7 or 2.8 in standard length; snout 3.2 to 3.5, eye 3.6 to 3.8, and postorbital length of head 2.3 or 2.4, all in length of head; maxillary reaches not quite to below anterior margin of pupil; area above premaxillary groove naked; preorbital edge smooth or slightly rough; rear margin of preopercle serrate; gill rakers strong and short; second dorsal spine long, reaching past third dorsal spine and longer than head, contained 2.5 or 2.6 in standard length and equal to or a little longer than greatest depth of body; second anal spine long and strong, a trifle shorter than head, about three times in standard length; distal margins of dorsal and of anal fins concave; pectoral fins long, pointed, the first or second branched rays longest and reaching to opposite origin of anal fin; second dorsal spine when depressed reaches to opposite bases of seventh or eighth soft dorsal rays; second anal spine when depressed reaches to caudal fin base or nearly to it; profile of head barely concave over orbits; first soft pelvic ray with a filament, the pelvic spine shorter but reaching a little past anus; third row of scales below lateral line continuous to caudal, rarely the second row; greatest depth of body at origin of dorsal fin.

Color.—Each row of scales has a darkly pigmented area giving the appearance of streaks of small spots along each row of scales along upper sides; distal margin of dorsal fin blackish, and rest of fin dusky, except the basal sheath of scales, which are white; caudal fin dusky; anal dusky forward; pectorals pale; snout dusky and dorsal tip of

upper lip dusky, rest of upper and lower lips white; these young specimens have 4 to 7, usually about 5, narrow vertical dusky bars on sides.

In addition, I refer to this species a small specimen, 17 mm. in standard length, collected April 6, 1938, by Dr. F. F. Bond in a coastal lagoon 15 km. north of Maracaibo.

Family SCIAENIDAE: Croakers; Corvinas

During my study of this family I carefully dissected the skin and scales from the dorsal and lateral surfaces of the head for the purpose of determining which genera have "cavernous skulls" and found that all of the genera listed herein have the narrow bony bridges and sunken spaces, otherwise called cavernous skulls. In those genera and species with broad interorbital spaces similar to *Stellifer* and with thinner skin or scales the caverns are more easily felt by touch than in certain other genera such as *Equetus*.

The counting of the number of scale rows above the lateral line is subject to error since certain rows run together as they approach the lateral line. To avoid this error and keep my counts consistent, I counted the rows directly above the lateral line.

KEY TO THE SCIAENIDAE REPORTED FROM VENEZUELA

- 1a. Tip of chin with a short stubby barbel, or each side of lower jaw anteriorly with a row of minute barbels; width of preorbital wider than eye diameter; scales along lateral line not enlarged; lower jaw included, teeth in villiform band; teeth in upper jaw in a villiform band, outer row a little enlarged.
- 2a. Tip of chin with a short, stout, blunt barbel; gill rakers on first arch very short or almost rudimentary.
- 3a. Anal with one weak or nonpungent spine; preopercular edge not serrate but its edge rather firm; first soft ray of pelvic fin not ending in a filamentous tip; dorsal rays X-I, 23 to 25; anal rays I, 7; pectoral rays 22 or 23; scale rows 74 to 82.

Menticirrhus martinicensis Cuvier and Valenciennes

- 3b. The two anal spines pungent; preopercular edge finely serrate; tip of first soft pelvic ray more or less ending in a short filament.
- 4a. Vertical scale rows above lateral line 57 and 58 (in two counts); dorsal rays X-I, 26 to 28; barbel blunt.

Umbrina coroides Cuvier and Valenciennes

- 4b. Vertical scale rows 48; dorsal rays X-I, 22; barbel tapering to a point.

Umbrina gracilicirrhus Metzelaar

- 2b. Each side of middle of lower jaw anteriorly with a short row of fine barbels; gill rakers of moderate length, well developed on first arch; two pungent anal spines; first soft pelvic ray with a short filamentous tip; dorsal rays X-I, 26 or 27; anal rays II, 8; pectoral rays 18 or 19; gill rakers 7 or 8 + 13 to 15; scale rows about 68 to 70. — *Micropogon furnieri* (Desmarest)
- 1b. No barbels at tip of chin or on lower jaw.
- 5a. Scales along the lateral line enlarged, partly overlapped by adjoining smaller scales; mouth terminal, sometimes oblique in position; two pungent anal spines; scale rows below lateral line slanting obliquely

upward to lateral line, not parallel with it on caudal peduncle; lower jaw nearly equal to upper, with two irregular rows of teeth, inner row enlarged some more or less caninelike; upper jaw with a narrow villiform band of teeth, with outer row enlarged, more or less small canines; gill rakers moderately long; maxillary reaching well under or past eye; preorbital usually wider than eye.....**Plagioscion** Gill

5b. Scales along the lateral line of about same size as adjoining scales.

6a. Preopercular edge with one or more projecting sharp spines; 2 pungent anal spines.

7a. Anal rays II,8; teeth in upper jaw in a villiform band with outer row a little enlarged.

8a. Lower jaw included, with the villiform teeth in a wide band, none of which is enlarged; mouth inferior, scarcely oblique; gill rakers short to moderately long, 9 or 10 + 1 + 16 to 18; first soft ray of pelvic fins ending in a short filament; dorsal rays XI,I (rarely XII,I) 21 or 22; anal rays II,8; pectoral rays ii,16 or ii,17; scale rows 52 to 54.....**Ophioscion venezuelae** Schultz

8b. Lower jaw a little included, with a narrow band of villiform teeth, the inner row of which is a trifle enlarged; mouth nearly terminal, oblique; gill rakers long and slender, 19 or 20 + 1 + 28 to 30; first soft ray of pelvic fin ending in a short filament; dorsal rays XI, I, or XII,I,21 to 24; anal rays II,8; pectoral rays about 20; scale rows about 50 or 51. (See fig. 19)..**Stellifer rastrifer** (Jordan)

8c. Lower jaw oblique, equals upper jaw or nearly so, with the minute teeth in a narrow band of 2 or 3 rows forward and in a single row of slightly enlarged teeth posteriorly; gill rakers moderately long, 9 or 10 + 1 + 15 or 16; first soft ray of pelvic fin not ending in a filament; dorsal rays X,I,23 to 25; anal rays II,8; pectoral rays about 17; scale rows about 55 or 56. (See fig. 19.)

Bairdiella ronchus (Cuvier and Valenciennes)

7b. Anal rays II,6; lower jaw included, snout projecting a little in front of the premaxillary, the maxillary not quite reaching to under front of eye; teeth in both jaws minute, in villiform bands, none enlarged; preopercular edge with several short spines; gill rakers rather short, 5 or 6 + 1 + 10 or 11 on first gill arch; dorsal rays X,I,24 to 29, usually 25 to 27; pectoral rays 16 to 18; vertical scale rows above lateral line 81 to 87.....**Pachyurus schomburgkii** Günther

6b. Preopercular edge membranous, without pungent spines or with the edge rather hard and finely serrate, but without projecting spines (except in young about 35 mm. and shorter); preorbital usually narrower than eye.

9a. Anal spines minute or nonpungent or flexible; upper jaw with canine teeth; lower jaw longer than upper, entering or nearly entering profile.

10a. Upper jaw with a pair or so of lance-shaped teeth, the tips flattened, with cutting edges; canine teeth present in lower jaw in a single row; first soft ray of pelvic fin not ending in a filamentous tip, dorsal rays X,I,28; anal II,9; gill rakers 3 + 1 + 9; scale rows 120; pectoral 16 (counts made on one specimen).

Macrodon ancylodon Bloch and Schneider

10b. Upper jaw with a pair or so of round conical pointed teeth, and other teeth enlarged, and in a narrow band; teeth of lower jaw in a narrow band with outer and inner teeth enlarged and with

some villiform teeth between the enlarged ones forward; gill rakers moderately short; first soft pelvic ray without filamentous tip. **Cynoscion** Gill (see key to species on p. 150).

9b. Two pungent anal spines.

11a. First or spiny dorsal fin with second to sixth spines short as length of head, not filamentous.

12a. Teeth of upper jaw in a villiform band with outer row enlarged; lower jaw with single row of teeth; lower jaw slightly longer than upper but not entering profile; first soft ray of pelvic fin without filamentous tip; dorsal rays X-I, 23 to 25; anal rays II, 9; gill rakers 8 or 9 + 1 + 17 or 18; scale rows about 50 to 52. ----- **Corvula sanctae-luciae** Jordan

12b. Teeth of upper jaw very small in one row with 2 or 3 rows posteriorly; lower jaw very oblique, tip of chin projecting, not quite entering profile; teeth of lower jaw small in a single row; first soft ray of pelvic fin with a short filamentous tip; body compressed; dorsal rays X-I, 27 to 31; anal rays II, 6; gill rakers about 9 or 10 + 1 + 18 to 20; scale rows about 48 to 49. ----- **Larimus breviceps** Cuvier and Valenciennes

11b. Second to sixth dorsal spines long, filamentous, at least $1\frac{1}{2}$ times length of head and when fin is depressed reaching to middle of base of soft dorsal fin; a broad brownish band bordered by a pale band from base of spiny dorsal fin curves downward behind pectoral fin thence posteriorly along midaxis of body, two other dark bands separated by pale ones occur on head, one behind eye and the other through front of eye; median fins pale spotted; dorsal rays about XIII-47 to 50; anal II, 7.

Equetus punctatus Bloch

Genus MENTICIRRHUS Gill

Menticirrhus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 86. (Genotype, *Perca alburnus* Linnaeus = *Cyprinus americanus* Linnaeus.)

MENTICIRRHUS MARTINICENSIS (Cuvier and Valenciennes)

Umbrina martinicensis CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 5, p. 186, 1830 (Martinique).

U.S.N.M. No. 128252, 1 specimen, 47 mm. in standard length, from Point Macolla, U. S. S. *Niagara*, April 19, 1925.

U.S.N.M. No. 128253, 1 specimen, 46 mm., southern coast of the Gulf of Venezuela, U. S. S. *Niagara*, November 15, 1925.

U.S.N.M. No. 128254, 3 specimens, 179 to 295 mm., Estanques Bay, U. S. S. *Niagara*, December 8 and 12, 1924.

The following counts were made on the above listed specimens:

Dorsal rays X-I, 23; X-I, 25; X-I, 24; X-I, 24; X-I, 23; anal rays I, 7; I, 7; I, 7; I, 7; I, 7; pectoral rays —; 23; 22; 22; 22; scales —; 74; 75; 82; 79; usually 6 or 7 scales from lateral line to front of soft dorsal and 11 or 12 to anal origin; gill rakers about 3 or 4 + 5 to 8 counting rudiments; about 50 pores in the lateral line.

Genus UMBRINA Cuvier

Umbrina CUVIER, Le règne animal, ed. 1, vol. 2, p. 297, 1817. (Genotype, *Sciaena cirrhosa* Linnaeus.)

UMBRINA COROIDES Cuvier and Valenciennes

Umbrina coroides CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 5, p. 187, 1830 (Brazil).

U.S.N.M. No. 128259, 1 specimen, 265 mm. in standard length, from Amuay Bay, U. S. S. Niagara, May 15, 1925.

The following counts were made on the above listed specimen. Dorsal rays X-I, 26; anal rays II, 7; vertical scale rows 57 above lateral line, $5\frac{1}{2}$ from lateral line to base of first soft dorsal ray, and 10 from lateral line to anal origin.

UMBRINA GRACILICIRRHUS Metzelaar

Umbrina gracilicirrhus METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies, 1904-1905, p. 72, fig. 24, 1919 (coast of Venezuela).

Genus MICROPOGON Cuvier and Valenciennes

Micropogon CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 5, p. 215, 1830. (Genotype, *Micropogon lineatus* Cuvier and Valenciennes = *Perca undulata* Linnaeus.)

MICROPOGON FURNIERI (Desmarest)

Umbrina furnieri DESMAREST, Première décade ichthyologique—Cuba, p. 22, pl. 2, fig. 3, 1823 (Havana) (ref. copied).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies, 1904-1905, p. 71, 1919 (Carupana, Venezuela).

U.S.N.M. No. 121748, 2 specimens, 108 and 114 mm., Lago de Maracaibo at Yacht Club, Maracaibo, May 16, 1942.

U.S.N.M. No. 121747, 1 specimen, mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

The following collections were made by the U. S. S. Niagara:

U.S.N.M. No. 128247, 1 specimen, 310 mm. in standard length, Piedras Bay, Gulf of Venezuela, March 14, 1925.

U.S.N.M. No. 128246, 1 specimen, 213 mm., Gulf of Venezuela, 1924-25.

The following counts were made: Dorsal rays X-I, 26 in 4 specimens and X-I, 27 in one; anal rays II, 8 in 5 specimens; pectoral rays 19; 18; 18; gill rakers on first gill arch 7+14; 8+15; 8+13; and 7+13; vertical scale rows above lateral line 68 and 70; 7 or 8 scales from lateral line to base of soft first dorsal ray and 7 to 9 from lateral line to anal origin.

Genus PLAGIOSCION Gill

Plagioscion GILL, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 82. (Genotype, *Sciaena squamosissima* Heckel.)

Since I have no specimens from Venezuela I hesitate to make a key. Steindachner (1917b) reviews eight species of this genus, in-

cluding those recorded below from Venezuela, and his contribution should be consulted for the identification of specimens.

PLAGIOSCION SQUAMOSISSIMUS (Heckel)

CORVINA o CORVINATA

Sciaena squamosissimus HECKEL, Ann. Wein. Mus. Naturg., vol. 2, p. 438, pl. 30, figs. 26-28 (scales), 1840 (Río Negro; Río Branco).

Plagioscion squamosissimus STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 151, 1879 (Río Negro; Ciudad Bolívar, Venezuela); Sitzb. Akad. Wiss. Wien, vol. 126, p. 663, pl. 1, fig. 2, pl. 2, fig. 1, 1917 (Río Negro; Ciudad Bolívar on Río Orinoco).

Sciaena amazonica PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 469 (Calabozo, Venezuela).—SACHS, Aus den Llanos, 1879, p. 226 (Calabozo).—REGAN, Proc. Zool. Soc. London, 1905, pt. 1, p. 190 (Río Negro).—RÖHL, Fauna descriptiva de Venezuela, p. 407, 1942 (Orinoco).

PLAGIOSCION AURATUM (Castelnau)

Johnius auratus CASTELNAU, Animaux nouveaux ou rares recueilles dans les parties centrales de l'Amérique de Sud, vol. 2, pt. 7. Poissons, p. 12, pl. 4, fig. 2, 1855 (Ucayala).

Plagioscion auratum EIGENMANN AND ALLEN, Fishes of western South America, p. 387, 1942 (Apure River).

Genus OPHIOSCION Gill

Ophioscion GILL, Proc. Acad. Nat. Sci. Philadelphia, 1863, p. 165. (Genotype, *Ophioscion typicus* Gill, U. S. N. M. No. 22861, west coast of Panama.)

OPHIOSCION VENEZUELAE Schultz

FIGURE 18

Ophioscion venezuelae SCHULTZ, Proc. U. S. Nat. Mus., vol. 96, p. 131, fig. 7, 1945 (Caño de Sagua, 25 km. north of Sinamaica, Venezuela).

The following types were collected by Leonard P. Schultz in Venezuela during 1942: Holotype, U.S.N.M. No. 121749, and 6 paratypes, U.S.N.M. No. 121750, all from south of Caño de Sagua about 25 km. north of Sinamaica, May 12.

Description.—Certain measurements were made, and these data, recorded below, are expressed in hundredths of the standard length, first for the holotype and then for three paratypes in parentheses, respectively. Standard lengths in millimeters, 139.5 (68.8; 150; 139).

Length of head 28.6 (30.5; 32.4; 30.2); greatest depth of body 30.1 (27.0; 31.2; 30.9); diameter of eye 6.24 (7.12; 5.93; 6.11); length of snout 8.74 (8.14; 9.34; 8.63); distance from tip of snout to rear edge of maxillaries 13.1 (12.6; 13.0; 13.2); least width of preorbital 3.65 (3.63; 4.13; 39.5); postorbital length of head 18.0 (15.8; 17.9; 18.5); width of bony interorbital space 9.68 (9.16; 9.66; 10.3); length of caudal peduncle 25.1 (25.1; 24.3; 25.4); least depth of caudal peduncle 10.7 (9.88; 10.9; 10.9); length of base of second dorsal fin 32.6 (32.5; 32.1;

32.4); length of base of anal fin 11.0 (11.6; 11.7; 11.2); length of longest dorsal spine 18.6 (21.1; 18.5; 19.3); length of longest soft dorsal ray— (13.1; —; 13.2); longest soft anal ray 16.1 (17.0; —; 14.7); length of second anal spine 16.3 (17.4; —; 15.8); longest pectoral fin ray 25.2 (23.1; 22.7; 25.2); longest soft pelvic ray 13.0 (18.6; 12.3; 13.9); length of pelvic spine 9.32 (11.5; 8.34; 8.85); longest or middle

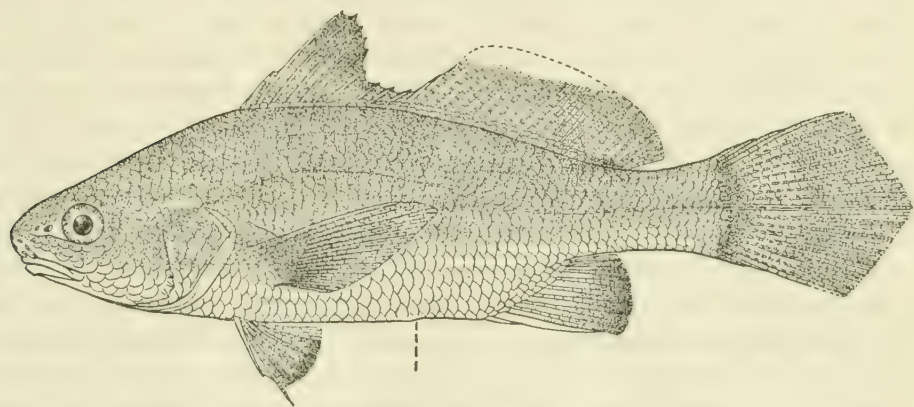


FIGURE 18.—*Ophioscion venezuelae* Schultz: Holotype (U.S.N.M. No. 121749), 139.5 mm. in standard length. Drawn by Mrs. Aime M. Awl.

caudal fin rays 25.9 (26.9; 22.7; 25.5); distance from tip of snout to dorsal origin 37.1 (35.9; 38.5; 37.7); snout to anal origin 67.2 (65.4; 65.1; 66.2); snout to pectoral insertion 32.6 (31.1; 32.2; 31.6); snout to pelvic insertion 32.6 (30.5; 30.6; 30.9); length of longest gill rakers on first gill arch 1.58 (2.76; 1.66; 3.22).

The following counts were made, respectively: Dorsal rays XI-I, 21 (XI-I,22; XII-I,21; XI-I,21; XI-I,21; XI-I,21; XI-I,22); anal rays on all types II,8; pectoral rays ii, 17-ii, 17 (ii,16; ii,17-ii,17; ii,17-ii,17; ii,16); pelvics always I,5; number of vertical scale rows above lateral line 52 (53; 52; 54); scales from dorsal origin to lateral line 6 (—; 6; 6) and from base of first soft dorsal ray to lateral line 6 (—; 6; 6); scales from lateral line to anal origin 8 (—; 8; 8); scales in a zigzag row around the caudal peduncle 19 (—; 19; 19); number of gill rakers on first gill arch 9+1+16 (—; 10+1+18; 10+1+18; 9+1+16; 10+1+16).

Head depressed forward but rounded dorsally, the interorbital space convex, broad, about equal to the snout; body compressed; anterior profile nearly straight but the dorsal contour curved, the ventral contour but slightly curved backward to anus; back highest at base of spiny dorsal fin; eye about $2\frac{1}{2}$ in postorbital length of head, 1.8 in interorbital space; posterior nasal opening rounded, slightly larger than the anterior one; tip of lower jaw without barbels; anal origin

equidistant between pelvic insertion and midcaudal fin base; pelvic fins reaching halfway to anus, the first soft ray ending in a short filament; preopercle with eight or nine short spines, the lowest one strongest but not hooked downward; caudal peduncle least depth $2\frac{1}{3}$ in its length; tips of pectoral fins reaching a trifle past anus; teeth in jaws in bands, the outer row of upper jaw a little enlarged; pseudobranchiae well developed; gill rakers short, not quite so long as pupil diameter; scales strongly ctenoid; lateral line curved over pectoral fin, then running a straight course on caudal peduncle along its midaxis; fourth scale row below lateral line, anteriorly, the first one extending to base of caudal fin; first dorsal spine rudimentary, second 2.5 in third, the latter nearly as long as the fourth; second and eighth to eleventh and the next spine heavier than the third to seventh spines of dorsal fin; fourth or longest dorsal spine about equal to postorbital length of head; distal margin of spiny dorsal fin truncate or a very little concave, that of soft dorsal probably a trifle rounded (the tips of the soft rays are lacking and this cannot be determined accurately); middle rays of caudal fin longest, edges of lobes more or less truncate to rounded (double truncate); distal margins of anal and pelvic fins a little rounded; pectoral fins somewhat pointed, the fourth branched ray from above longest.

Color.—In alcohol the upper sides and back are grayish brown, white below; dorsal, anal, and pelvic fins dusky, more intensely pigmented distally; soft dorsal and caudal fins dusky; pectoral fin darker than other fins except tip of spiny dorsal; lower jaw and upper lip white; peritoneum white. In the smaller paratypes the dusky upper sides are broken up with several pale blotches, which appear to have a small cyst at their centers.

Genus STELLIFER Oken

Stellifer OKEN, Isis, 1817, p. 1182. (Genotype, *Bodianus stellifer* Bloch.) (Ref. copied.)

STELLIFER RASTRIFER (Jordan)

Stelliferus rastrifer JORDAN, in Jordan and Eigenmann, Rep. U. S. Fish Comm. for 1886, vol. 14, pp. 391, 393, 1889 (coast of Brazil).

U. S. N. M. No. 128257, 3 specimens, 16.5 to 72.5 mm., Jacuque Point, U. S. S. Niagara, January 26, 1925.

U. S. N. M. No. 128258, 8 specimens, 38 to 123 mm., Point Macolla, U. S. S. Niagara, April 19, 1925.

The following counts were made: Dorsal rays XI–I, 22 in 4 specimens, XI–I, 23 in one, XI–I, 24 in two, XII–I, 21 in two, XII–I, 22 in one; anal rays II, 8 in 8 specimens; gill rakers on first gill arch were $19 + 1 + 28$ and $20 + 1 + 30$, and in two other counts on lower part of first gill arch there were 28 and 30 gill rakers; pectoral fin rays in

one specimen counted numbered 20, and the vertical scale rows above lateral line numbered 51 in two specimens with 6 scales from base of first soft dorsal ray to lateral line and 8 from the lateral line to the anal origin.

Genus BAIRDIELLA Gill

Bairdiella GILL, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 33. (Genotype, *Bodianus argyroleucus* Mitchill=*Dipterodon chrysurus* Lacepède.) (Ref. copied.)

BAIRDIELLA RONCHUS (Cuvier and Valenciennes)

Corvina ronchus CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 5, p. 107, 1830 (Surinam; San Domingo; [?] Maracaibo).

Bairdiella ronchus EIGENMANN, Mem. Carnegie Mus., vol. 5, p. 72, 1912 (Maracaibo).

U.S.N.M. No. 121746, 4 specimens, 61.5 to 102 mm., from mouth of Caño de Sagua, 25 km. north of Sinamica, March 12, 1942.

The following counts were made: Dorsal rays X–I, 23 in one specimen, X–I, 24 in two, and X–I, 25 in one; anal rays II, 8 in 4 specimens; pectoral rays 17 in one count; gill rakers on first gill arch $10 + 1 + 16$ in one, $9 + 1 + 15$ in three specimens; scale rows in one count 55.

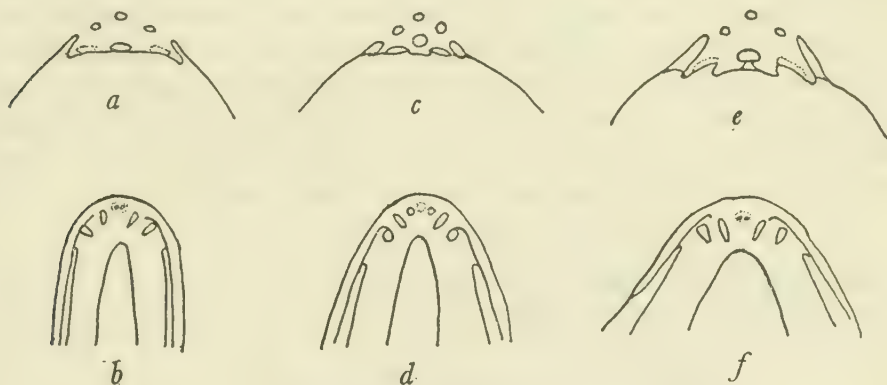


FIGURE 19.—Diagrammatic sketches of the tip of the snout and of the anterior part of the underside of the lower jaw of three species of sciaenid fishes: *a*, Snout tip of *Bairdiella chrysura* (Lacepède); *b*, lower jaw of *B. chrysura*; *c*, snout tip of *Stellifer rastriifer* (Jordan); *d*, lower jaw of *S. rastriifer*; *e*, snout tip of *Ophioscion typicus* Gill (type U.S.N.M. No. 22861); *f*, lower jaw of *O. typicus*. Sketches by author.

Genus PACHYURUS Agassiz

Pachyurus AGASSIZ, in Spix and Agassiz, Selecta genera et species piscium Brasilian, p. 128, 1831. (Genotype, *Pachyurus squamipinnis* Agassiz.)

PACHYURUS SCHOMBURGKII Günther

Pachyurus schomburgkii GÜNTHER, Catalogue of the fishes in the British Museum vol. 2, p. 282, 1860 (Rio Capim, Pará; Caripe, Pará, Brazil).

Dr. F. F. Bond collected 45 specimens 17 to 57 mm. in standard length in the Río Apure at San Fernando de Apure on February 16, 1938. These small specimens warrant a brief description because this and allied species are not well known and are rather scarce in museum collections. In fact, for several reasons, among them the small size and coloration of the specimens, I am not even sure these specimens are *P. schomburgkii*.

The following counts were made: Dorsal rays X, I, 24 in one, X, I, 25 in three, X, I, 26 and X, I, 27 in four each, one count each of X, I, 28 and X, I, 29. Anal rays II, 6 in 14 counts. Pectoral rays ii, 16 in two; ii, 17 in five; and ii, 18 in three counts. Gill rakers on first gill arch $5 + 1 + 10$ in three counts, $5 + 1 + 11$ in two, $6 + 1 + 10$ in six, and $6 + 1 + 11$ in three counts. Number of vertical scale rows from upper edge of gill opening to midbase of caudal fin 81 in one count, 82 in two, 83 in two, 84 in one, 85 in six, 86 in one, and 87 in one count. There were 8 scales from the base of the first soft dorsal ray to lateral line in 14 counts and from the anal origin to lateral line 9 scales in four and 10 in eight counts.

The coloration is somewhat uniform. A series of about five to seven vertically elongate brown spots occur along the middle of the sides; on the smallest specimens only occur four brown blotches on the back along base of dorsal fin, the first in front of spiny dorsal, second along rear of base of spiny dorsal, and two along base of soft dorsal; opercle of all specimens with a brownish blotch; tips of dorsal spines blackish; soft dorsal with a row of small dark spots extending along its middle on the membranes; caudal fin dusky.

Genus MACRODON Schinz

Macrodon SCHINZ, Das Thierreich, vol. 2, p. 482, 1822. (Genotype, *Lonchurus ancylodon* Bloch and Schneider.) (Substitute name for *Ancylodon*, pre-occupied.) (Ref. copied.)

MACRODON ANCYLODON (Bloch and Schneider)

Lonchurus ancylodon BLOCH and SCHNEIDER, Systema ichthyologiae, p. 102, pl. 25, 1801 (Surinam).

U.S.N.M. No. 128251, 1 specimen, 270 mm. in standard length, Gulf of Venezuela, depth 35 feet, U. S. S. *Niagara*, December 1, 1924.

This specimen has X-I, 28 dorsal rays and II, 9 anal rays. The gill rakers on the first gill arch number $3 + 1 + 9$ and are about one-third the diameter of the eye. The vertical scale rows above the lateral line number 120, and there are about 13 scales from base of first soft dorsal ray to lateral line and about 15 from anal origin to lateral line. The pectoral fin has about 16 rays. The pectoral fins extend considerable distance past tips of pelvises. The soft dorsal fin is not heavily scaled except its basal two-thirds but caudal and anal fins are thickened with scales over two-thirds the way out.

Genus CYNOSCION Gill

Cynoscion GILL, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 81. (Genotype, *Otolithus toeroe* Cuvier and Valenciennes=*Cheilodipterus acoupa* Lacépède.)

Undoubtedly additional species of *Cynoscion* will be reported from Venezuela, such as *jamaicensis* from the West Indies and *acoupa* from British Guiana.

The following key, constructed mostly from the literature, should serve to distinguish those species expected to occur in Venezuelan waters:

1a. Soft dorsal rays 23 to 30.

2a. Soft dorsal rays 29 or 30; anal rays usually II,8; scales cycloid, with about 120 to 130 vertical rows above lateral line; about 6 gill rakers on lower part of first gill arch; head 3.5 to 3.66; depth 4.8 to 5.2.

*Cynoscion virescens*²¹ (Cuvier and Valenciennes)

2b. Soft dorsal rays 23 to 25; anal II,9; scales ctenoid, in about 68 to 79 vertical rows above lateral line; about 4+7 on first gill arch; head 3.2 to 3.4; depth 3.5 to 3.8.....*Cynoscion jamaicensis*²¹ (Vallant and Bocourt)

1b. Soft dorsal rays 18 to 22.

3a. Scales cycloid in about 100 to 120 rows above lateral line; soft dorsal rays 20 to 22, anal II,10 or 11; gill rakers about 2+1+6 or 7 on lower part of first gill arch; head 3 to 3.4; depth 3.6 to 4.2.

Cynoscion leiarchus (Cuvier and Valenciennes)

3b. Scales ctenoid, in from 65 to 90 rows above lateral line; dorsal soft rays 18 to 21; gill rakers on first gill arch 3 to 5+8 to 10; anal rays II,8 to 10.

4a. Soft dorsal rays 20 to 21; anal rays II,8 to 10; scales with pores number 57 to 64; head 3.8 to 4; depth 4; soft dorsal and anal heavily scaled; highest dorsal spine 1.8 in head; pectorals extending about two-thirds the way out the pelvics; axil of pectoral dark.

*Cynoscion steindachneri*²¹ (Jordan and Eigenmann)

4b. Soft dorsal rays 19 to 21; anal rays II,8 or 9; scales with pores number 55 to 65; soft dorsal and anal with basal two-thirds scaled only; pectorals not quite reaching tips of pelvics; head 3.4 to 3.8; depth 3.8 to 4; axil of pectoral pale.....*Cynoscion acoupa*²¹ (Lacépède)

4c. Soft dorsal rays 18 or 19, usually 18; anal rays II,8; scales with pores 54 to 59; soft dorsal and anal with scales on basal one-third only; head about 3.25; depth 4.25; axil of pectoral dark.

Cynoscion maracaiboensis, new species

CYNOSCION LEIARCHUS (Cuvier and Valenciennes)

CORVINA

Otolithus leiarchus CUVIER and VALENCIENNES, Histoire naturelle des poissons, vol. 5, p. 78, 1830 (Brazil; Cayenne).

U.S.N.M. No. 128255, 1 specimen 395 mm. in standard length, Amuay Bay. U. S. S. *Niagara*, May 15, 1925.

U.S.N.M. No. 128256, 1 specimen 395 mm., Estanques Bay, U. S. S. *Niagara*, December 8, 1924.

U.S.N.M. No. 123198, 3 specimens, 23 to 26 mm., south coast of Venezuela, U. S. S. *Niagara*; these are identified with doubt as this species. They have II,11 anal rays and X-I, 21 to 23 dorsal rays.

²¹ Not yet reported from Venezuela;

CYNOSCION MARACAIBOENSIS, new species

CORVINA DE LAGO

FIGURE 20

Otolithus toc-roe (in part) CUVIER and VALENCIENNES, Histoire naturelle des poissons, vol. 5, p. 72, 74, 1830 (Lago de Maracaibo).

Otolithus cayennensis (in part) GÜNTHER, Catalogue of the fishes in the British Museum, vol. 2, p. 309, 1860 (Lago Maracaibo).

Holotype.—U.S.N.M. No. 121742, 255 mm. in standard length, collected in the Río Agua Caliente, 2 to 3 km. above Lago de Maracaibo, Venezuela, by Leonard P. Schultz, May 1, 1942.

Paratypes.—(All paratypes collected by Leonard P. Schultz in 1942).

U.S.N.M. No. 121743, a specimen, 226 mm., bearing same data as the holotype.

U.S.N.M. No. 121745, 1 specimen, 266 mm., from Río de Los Pájaros, 3 km. above Lago de Maracaibo, April 30.

U.S.N.M. No. 121744, 2 specimens, 239 and 261 mm., Lago de Maracaibo, 2 km. off Lagunillas, March 15.

Description.—Measurements were made on the types and these, expressed in hundredths of the standard length, are recorded first for the holotype, then for the four paratypes in parentheses, respectively.

Standard lengths in millimeters 255 (266; 226; 261; 239).

Length of head 31.0 (29.3; 30.3; 28.7; 29.0); greatest depth of body 23.1 (21.8; 22.6; 22.8; 24.3); diameter of eye 5.49 (5.26; 5.75; 5.25; 5.44); length of snout 6.88 (7.14; 7.26; 6.97; 6.90); tip of snout to rear of maxillary 13.3 (13.3; 13.5; 13.0; 12.8); least width of preorbital 2.20 (1.88; 2.21; 2.04; 1.88); postorbital length of head 19.3 (18.6; 18.1; 17.4; 17.4); least width of bony interorbital space 5.53 (5.64; 5.75; 5.60; 5.15); length of caudal peduncle or distance from base of last anal ray to midcaudal fin base 21.2 (22.1; 20.8; 21.3; 20.9); least depth of caudal peduncle 7.26 (7.70; 7.78; 7.51; 7.95); length of base of second dorsal fin 31.8 (33.1; 33.4; 34.1; 33.1); length of base of anal fin 9.10 (9.58; 10.2; 9.20; 9.79); length of longest spine of dorsal fin 15.7 (14.1; 16.0; 14.3; —); longest soft ray of dorsal 13.5 (13.7; 14.1; —; —); longest soft ray of anal 14.9 (13.7; 14.7; 14.7; 14.2); length of second anal spine 6.47 (6.20; 6.33; 6.13; 6.07); longest ray of pectoral fin 17.1 (16.2; 17.7; 17.5; 16.9); longest soft ray of pelvic fin 17.9 (17.1; 17.0; 16.5; 17.3); length of pelvic spine 10.2 (10.7; 11.5; 10.4; 9.50); length of longest or middle rays of caudal fin 22.6 (21.8; 23.2; 23.0; 23.2); tip of snout to dorsal origin 35.3 (35.3; 35.2; 33.5; 34.7); snout to anal origin 69.8 (72.6; 72.6; 69.7; 72.4); snout to pectoral insertion 28.9 (28.6; 29.4; 27.4; 27.5); snout to pelvic insertion 30.6 (32.3; 31.9; 31.6; 31.6); length of longest gill raker 4.00 (3.57; 3.10; 4.22; 4.40).

The following counts were made respectively: Dorsal fin rays X-I, 19 (X-I, 18; X-I, 18; X-I, 18); anal rays II, 8 (II, 8; II, 8; II, 8; II, 8);

pectoral rays ii,14-ii,15 (ii,15; ii,15-ii,15; ii,15; ii,15); pelvic rays always I,5; number of gill rakers on first gill arch $5+1+9$ ($4+1+9$; $3+1+8$; $5+1+9$; $4+1+9$) the rudiments without elevations on upper anterior part of gill arch not counted usually number 2 or 3; vertical scale rows above lateral line 85 (79; 83; 81; 84); pores in lateral line 59 (60; 54; 57; 56); scales in a vertical row from lateral line to origin of spiny dorsal fin 9 (10; 10; 10; 10); to origin of second dorsal 9 (8; 9; 9; 9); and to anal origin 8 (8; 8; 8; 8); number of scales in a zigzag row around caudal peduncle 22 (23; 22; 22; 23).

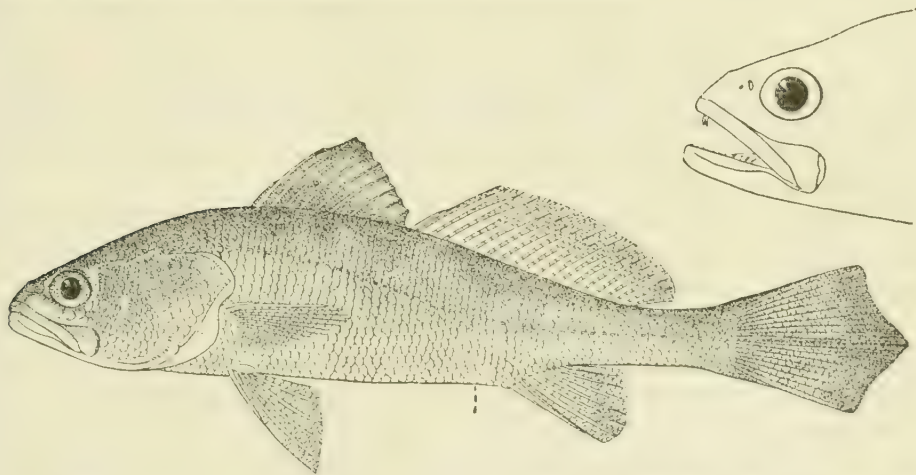


FIGURE 20.—*Cynoscion maracaiboensis*, new species: Holotype (U.S.N.M. No. 121742), 255 mm. in standard length. Drawn by Mrs. Aime M. Awl.

Body elongate, somewhat compressed, the head about 3.25, depth about 4.25, in standard length; anterior profile rounded, the greatest depth at origin of dorsal; snout a little longer than interorbital space; eye nearly equal to interorbital space, the latter $5\frac{1}{2}$ in head; rear edge of maxillary under rear margin of eye; two pairs of canines at midfront of premaxillary, these teeth hooked backward, the posterior pair largest; both upper and lower jaws with a band of villiform teeth, along the outer margin of which are widely spaced short canine teeth; preopercle without spines, with a membranous edge; opercle ending in a wide membranous edge, the portion between the flat spinelike angles at upper posterior end covered with minute scales; scales on head smooth but those on body ctenoid; scales above lateral line anteriorly much smaller than those between soft dorsal fin and lateral line; scales below lateral line anteriorly much larger than the scales above lateral line; pectoral fins not quite reaching opposite tips of pelvic fins; posterior margin of spiny dorsal fin nearly straight, the fourth spine projecting past the third when fin is distended; distal margin of soft dorsal nearly straight, the anterior rays longest,

gradually becoming a little shorter posteriorly; middle rays of caudal fin longest; distal margin of anal fin nearly straight, or slightly rounded; distal margins of paired fins rounded; origin of second dorsal fin equidistant between midcaudal fin base and front of eye; anus equidistant between pelvic insertion and midcaudal fin base; base of anal fin 3.5 times in base of second dorsal fin; pelvic fins reach one-half the way to the anus; least depth of caudal peduncle about 3 times in its length.

Coloration.—Silvery on sides, white below, dusky above; back along base of spiny and soft dorsal brownish; base of each lobe of caudal fin with some brownish pigment; spiny dorsal fin dusky brown and soft dorsal and anal fins pale dusky; a brownish spot at upper edges of pectoral fin base; pelvics pale; pectoral fin with a little brownish pigment; upper edges of maxillary and premaxillaries brownish; peritoneum white.

Remarks.—This new species of *Cynoscion* is abundant in Lago de Maracaibo, where large numbers are caught on hook and line and by jigging. It is usually in the market at Maracaibo.

Cynoscion maracaiboensis, with its ctenoid scales, with scales only on the basal parts of soft dorsal and of soft anal fins, and with but 18 or 19 soft rays in the dorsal fin, is readily distinguished from all other species of *Cynoscion* in American Atlantic waters except *C. acoupa*. *C. steindachneri*, *C. nothus*, *C. regalis*, *C. arenarius*, and *C. jamaicensis* all have 20 or more soft dorsal rays. *C. striatus* has about 19 or 20 soft dorsal rays, 8 or 9 soft anal rays, and very large scales, about 52 to 56 pores and 62 to 66 vertical scale rows above the lateral line, whereas *C. maracaiboensis* has 54 to 59 pores and 79 to 85 scale rows respectively. The number of gill rakers on a specimen of *C. striatus* numbered 6+1+16, including all rudiments that showed any development.

Cynoscion maracaiboensis is most closely related to *C. acoupa* (Lacepède) but differs from it by having 18 or 19 soft dorsal rays, 79 to 85 vertical scale rows above the lateral line, and 54 to 59 pores in lateral line instead of about 85 scale rows above, 19 to 21 soft dorsal rays, and about 55 to 66 pores in the lateral line, according to Ribeiro (Arch. Mus. Nac. Rio de Janeiro, vol. 17, p. 36, 1915) and Eigenmann (1912).

Genus CORVULA Jordan and Eigenmann

Corvula JORDAN AND EIGENMANN, Rep. U. S. Comm. Fish. for 1886, vol. 14, p. 377, 1889. (Genotype, *Johnius batabanus* Poey.)

CORVULA SANCTAE-LUCIAE Jordan

Corvula sanctae-luciae JORDAN, Proc. U. S. Nat. Mus., vol. 12, p. 649, 1890.

U.S.N.M. No. 128248, 2 specimens, 54 and 56 mm. in standard length, from Jacuque Point, U. S. S. Niagara, January 26, 1925.

U.S.N.M. No. 128261, 1 specimen, 178 mm., from Estanques Bay, U. S. S. *Niagara*, December 8, 1924.

U.S.N.M. No. 128249, 1 specimen, 131 mm., from Point Macolla, U. S. S. *Niagara*, April 19, 1925.

The following counts were made on the above listed specimens: Dorsal rays X-I, 23; X-I, 25; X-I, 23; X-I, 23. Anal rays II, 9; II, 9; II, 9; II, 8. Number of gill rakers on first gill arch $8 + 1 + 17$; $8 + 1 + 17$; $9 + 1 + 18$; $8 + 1 + 17$. Vertical scale rows above lateral line 50; 51; 52. Usually 7 scales from lateral line to base of first soft dorsal ray and 7 scales to anal origin.

Genus LARIMUS Cuvier and Valenciennes

Larimus CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 5, p. 145, 1830. (Genotype, *Larimus breviceps* Cuvier and Valenciennes.)

LARIMUS BREVICEPS Cuvier and Valenciennes

Larimus breviceps CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 5, p. 146, pl. 111, 1830 (San Domingo; Brazil).

U.S.N.M. No. 128250, 3 specimens, Point Macolla, U. S. S. *Niagara*, April 19, 1925.

The following counts were made: Dorsal rays X-I, 31; X-I, 27; X-I, 27. Anal rays II, 6; II, 6; II, 6. Gill rakers, long, slender, on first arch number $9 + 1 + 20$; $9 + 1 + 18$. Number of vertical scale rows 49; 49; 48; 6 scales from lateral line to base of first soft dorsal ray and 6 to anal origin.

Genus EQUETUS Rafinesque

Equetus RAFINESQUE, Analyse de la nature, p. 89, 1815 (substitute for *Eques* Bloch, preoccupied). (Genotype, *E. americanus* Bloch = *Chaetodon lanceolatus* Linnaeus.)

EQUETUS PUNCTATUS Bloch

Eques punctatus BLOCH, in Bloch and Schneider, Systema ichthyologiae, p. 106, 1801 (Cuba).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 73, 1919 (coast of Venezuela).

Family MULLIDAE: Salmonetes

Genus MULLUS Linnaeus

Mullus LINNAEUS, Systema naturae, ed. 10, p. 299, 1758. (Genotype, *M. barbatus* Linnaeus.)

MULLUS AURATUS Jordan and Gilbert

Mullus barbatus auratus JORDAN AND GILBERT, Proc. U. S. Nat. Mus., vol. 5, p. 280, 1882 (Pensacola, Fla.).

The following specimen was identified by Dr. S. F. Hildebrand:

U.S.N.M. No. 123177, 1 specimen, 42 mm., Estanques Bay, U. S. S. *Niagara*, February 20, 1925.

Genus PSEUDUPENEUS Bleeker

Pseudupeneus BLEEKER, Versl. Akad. Amsterdam, vol. 14, p. 134, 1862. (Genotype, *P. prayensis* Bleeker.) (Ref. copied.)

PSEUDUPENEUS MACALATUS (Bloch)**CHIVO**

Mullus maculatus BLOCH, Naturgeschichte der ausländischen Fische, vol. 7, p. 95, 1793 (Brazil).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904–1905, p. 88, 1919 (Puerto Cabello, Venezuela).

Family POLYCENTRIDAE**Genus POLYCENTRUS Müller and Troschel**

Polycentrus MÜLLER AND TROSCHER, in Schomburgk, Reisen in Britisch-Guiana, vol. 3, p. 622, 1848. (Genotype, *Polycentrus schomburgkii* Müller and Troschel.)

POLYCENTRUS SCHOMBURGKII Müller and Troschel

Polycentrus schomburgkii MÜLLER AND TROSCHER, in Schomburgk, Reisen in Britisch-Guiana, vol. 3, p. 622, 1848.—REGAN, Proc. Zool. Soc. London, 1906, pt. 1, p. 391, pl. 25, fig. 12 (Trinidad; Venezuela; Guiana).—FOWLER, Fish Culturist, vol. 22, No. 9, p. 65, 1943 (Trinidad; Guiana; Venezuela).

3 specimens, 22 to 37 mm., near Caripito, William Beebe, August 10, 1942.

1 specimen, 34 mm., near Caripito, William Beebe, 1942.

Family CHAETODONTIDAE: Butterfly-fishes**Genus CHAETODON Linnaeus**

Chaetodon LINNAEUS, Systema naturae, ed. 10, p. 272, 1758. (Genotype, *Chaetodon capistratus* Linnaeus.)

CHAETODON STRIATUS Linnaeus

Chaetodon striatus LINNAEUS, Systema naturae, ed. 10, p. 275, 1758 (India).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904–1905, p. 91, 1919 (Venezuela).

Family EPHIPPIDAE**Genus CHAETODIPTERUS Lacepède**

Chaetodipterus LACEPÈDE, Histoire naturelle des poissons, vol. 4, p. 503, 1802. (Genotype, *Chaetodipterus plumierii* Lacepède.)

CHAETODIPTERUS FABER (Broussonet)**SPADEFISH**

Chaetodon faber BROUSSONET, Ichthyologia sistens piscium, p. 19, pl. 6, 1782.

Ephippus faber METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904–1905, p. 90, 1919 (Venezuela).

U.S.N.M. No. 123080, 1 specimen, 57 mm. in standard length, Cape San Román, U. S. S. *Niagara*, April 2, 1925.

U.S.N.M. No. 123183, 1 specimen, 15 mm., south coast of Gulf of Venezuela, U. S. S. *Niagara*, November 15, 1925.

Family ACANTHURIDAE: Surgeonfishes

Genus ACANTHURUS Forskål

Acanthurus FORSKÅL, Descriptiones animalium, p. 59, 1775. (Genotype, *Chaetodon schal* Forskål.)

ACANTHURUS HEPATUS (Linnaeus)

Teuthis hepatus LINNAEUS, Systema naturae, ed. 12, p. 507, 1766 (Carolina).

Acanthurus hepatus METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies, 1904-1905, p. 95, 1919 (Puerto Cabello, Venezuela).

Family CICHLIDAE: Mojarros de Río

KEY TO THE GENERA OF CICHLIDAE REPORTED FROM VENEZUELA

1a. Dorsal with a notch posteriorly in spinous part of fin; gill rakers elongate, setiform, about 5+16; lateral line continuous at least in young; preopercle entire; jaws with a band of villiform teeth; dorsal rays about XV, 17; anal rays III, 11 or 12; about 85 scale rows below lateral line from head to mid-caudal base; mouth large, lower jaw projecting a little; body elongate.

Cichla Bloch and Schneider

1b. Dorsal fin without a notch; gill rakers short, stubby, not elongate.

2a. A dark brown bar from dorsal origin through eye to isthmus, another across middle of body, and a third one from prolonged soft rays of dorsal and anal fins across body; base of caudal with dark bar and this fin barred; preopercular edge entire; dorsal rays XI to XIII, 23 to 30; anal rays V to VII, 24 to 32; teeth conical, occurring along the front and sides of the jaws; scale rows from head to midcaudal base 33 to 47; depth of body from 1 to 1.5 in standard length; scales rough; first soft rays of dorsal, anal, and pelvics prolonged or filamentous; jaws about equal.

Pterophyllum Heckel

2b. Body without 3 dark cross bars as described in 2a.

3a. Scales of the lateral line larger than those above or below it; preopercular edge serrated posteriorly; body elongate; lower jaw projecting; scale rows from upper edge of gill opening to mid-caudal fin base below lateral line 38 to 130; dorsal rays XVI to XXV, 11 to 19; anal rays III, 7 to 12-----

Crenicichla Heckel

3b. Scales along lateral line about same size as others; preopercular edge entire.

4a. Upper part of first gill arch with a downward-projecting lobe, the gill rakers near its margin; upper lateral line well separated from dorsal fin base; mouth small; premaxillary not greatly protractile; pre-orbital width twice the eye; scales rough, large, about 25 to 39; dorsal spines XII to XIX and anal spines III. (Not yet reported from Venezuela but to be expected in that region.)

Geophagus Heckel

4b. No downward-projecting lobe on upper part of gill arch.

5a. Anal spines III or IV, or if IV the lateral line is one-half a scale from dorsal fin posteriorly; soft vertical fins scaleless or with a row of scales at base only.

6a. Rear end of maxillary well exposed under eye; premaxillaries excessively protractile, the posterior ascending process extending to opposite rear of orbits, or past beginning of scaled area on top of head; gill rakers about 2+10 or 11; scales 23 or 24;

dorsal rays XIII or XIV, 9 to 11; anal rays III, 8 or 9; upper lateral line posteriorly with one-half scale between it and base of dorsal fin.....**Acaronia** Myers

6b. Rear end of maxillary not exposed.

7a. Upper lateral line separated from dorsal fin base by one-half a scale for part of its length posteriorly; preopercle scaled; dorsal rays XVI or XVII, 7 or 8; anal rays III or IV, 7 or 8; scales about 23 or 24; body somewhat elongate, compressed.

Nannacara Regan

7b. Upper lateral line one or more scale rows from dorsal fin base even at its posterior end; preopercle naked; body compressed; dorsal rays XIII to XVI, 7 to 12; anal III, 6 to 11.

Aequidens Eigenmann and Bray

5b. Anal spines IV to VII or if IV spines the lateral line is separated from the dorsal fin base by more than one row of scales; preopercle naked; teeth conical; inner ones smallest.

8a. Posterior ascending process of premaxillaries as long as head or extending as far as opposite rear of orbits, much past beginning of scaled area between orbits; lower jaw longest; the rear of maxillary much exposed and projecting beyond preorbital sheath; body compressed; dorsal rays XV or XVI (rarely XVII), 10 to 13; anal rays V to VI (rarely VII), 8 to 10; gill rakers about 8 to 11 on lower part of first arch; pores in lateral line about 20 or 21+9 to 11.....**Petenia** Günther

8b. Premaxillary process not extending past middle of interorbital space, and much shorter than head; dorsal rays XIV to XIX, 7 to 15; anal rays IV to XII, 6 to 14; base of soft rays of median fins usually with a few rows of scales....**Cichlasoma** Swainson

Genus CICHLA Bloch and Schneider

Cichla BLOCH AND SCHNEIDER, *Systema ichthologiae*, p. 336, 1801. (Restricted to *Cichla ocellaris* Bloch and Schneider by Heckel, *Ann. Wien. Mus. Naturg.*, vol. 2, p. 308, 1840. Genotype designated by Eigenmann, *Mem. Carnegie Mus.*, vol. 5, p. 509, 1912, as *Cichla ocellaris* Bloch and Schneider.)

CICHLA OCELLARIS Bloch and Schneider

PAVÓN

Cichla ocellaris BLOCH AND SCHNEIDER, *Systema ichthyologiae*, p. 340, 1801.

Crenicichla orinocensis [Humboldt] GÜNTHER, *Catalogue of the fishes in the British Museum*, vol. 4, p. 309, 1862 (Rio Negro; Orinoco).—EIGENMANN AND EIGENMANN, *Proc. U. S. Nat. Mus.*, vol. 14, p. 70, 1891 (Orinoco).—RÖHL, *Fauna descriptiva de Venezuela*, p. 384, 1942 (Orinoco; Rio Negro).

Cichla temensis EIGENMANN AND ALLEN, *Fishes of western South America*, p. 403, 1942 (Orinoco).

Genus PTEROPHYLLUM Heckel

Pterophyllum HECKEL, *Ann. Wien. Mus. Naturg.*, vol. 2, p. 334, 1840. (Genotype, *Pterophyllum scalaris* Heckel=*Platax scalaris* Cuvier and Valenciennes.)

KEY TO THE SPECIES OF PTEROPHYLLUM REPORTED FROM VENEZUELA

1a. Scale rows 33 to 38 on side of body from head to base of caudal fin; gill rakers 12 to 14 on lower part of first arch; lateral line pores 17 to 19+9 to 11;

dorsal rays XI to XIII, 23 to 27; anal rays V to VII, 24 to 29; cheek with 4 or 5 series of scales...**Pterophyllum scalaris** (Cuvier and Valenciennes)

- 1b. Scale rows 41 to 47; gill rakers on lower part of first arch 11; lateral line pores 17 to 19+9 to 11; dorsal rays XII or XIII, 27 to 30; anal rays V or VI, 28 to 32; cheek with 6 or 7 series of scales...**Pterophyllum altum** Pellegrin

PTEROPHYLLUM SCALARIS (Cuvier and Valenciennes)

SCALARE

Platax scalaris CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 7, p. 237, 1831.

Pterophyllum scalaris HECKEL, Ann. Wien. Mus. Naturg., vol. 2, p. 335, 1840 (Barra do Rio Negro).—STEINDACHNER, Sitzb. Akad. Wiss. Wien, vol. 71, p. 76, 1875 (Barra do Rio Negro).—REGAN, Proc. Zool. Soc. London, 1905, pt. 1, p. 190 (Rio Negro).

Pterophyllum EIGENMANN AND ALLEN, Fishes of western South America, p. 406, 1942 (Orinoco).

PTEROPHYLLUM ALTUM Pellegrin

Pterophyllum altum PELLEGRIN, Bull. Mus. Hist. Nat., Paris, vol. 9, p. 125, 1903 (Atabapo, Orinoco); Mem. Soc. Zool. France, vol. 16, p. 252, 1903 (Atabapo, Orinoco).—REGAN, Ann. Mag. Nat. Hist., Ser. 7, vol. 16, p. 442, 1905 (Rio Orinoco).—AHL, Zool. Anz., vol. 76, p. 255, 1938 (Orinoco).

Genus CRENICICHLA Heckel

Crenicichla HECKEL, Ann. Wien. Mus., vol. 2, p. 416, 1840. (Genotype, *Crenicichla vittata* Heckel designated in Jordan's Genera of fishes, vol. 2, p. 207, 1919.)

The species of *Crenicichla* centering around *macrophthalma* Heckel in the Rio Negro and Orinoco systems are not clearly defined and need revision. Probably *macrophthalma* should be broken into subspecies and *C. lacustris* (Castelnau) included with this group.

KEY TO THE SPECIES OF CRENICICHLA REPORTED FROM VENEZUELA

- 1a. Nostril nearer to tip of snout than eye; scales smooth, not rough or ctenoid, about 97 to 107 rows from upper edge of gill opening to base of caudal fin below lateral line; maxillary reaching to under anterior margin of eye; lateral-line pores 26 or 27 + 13 or 14; 10 or 11 scales from base of last dorsal spine to lateral line and 6 or 7 scales between lateral lines; dorsal rays XXI to XXIV, 16 or 17; anal rays III, 11 or 12; caudal spot absent; 10 to 12 dark cross bars dorsally, but absent on adults.
Crenicichla johanna Heckel
- 1b. Nostril nearer eye than snout tip or equidistant between snout tip and eye; scales rough or ctenoid at least on side of body.
 - 2a. Maxillary reaching to under the eye, at least considerably beyond the anterior margin of eye.
 - 3a. Dorsal rays XVII to XX, 13 to 16; ocellated black caudal spot present.
 - 4a. Humeral spot present on lateral line, not below it, except absent on young; a dark band from snout passes through eye to midbase of caudal fin; each side of tip of chin blackish, interspace pale; dorsal rays XVIII or XIX, 13 to 15; anal rays III, 9 or 10; scale rows from upper edge of gill opening to caudal base below lateral line 58 to 69;

pores in lateral line about 23 or 24 + 11; about 4 scales from base of last dorsal spine to lateral line and 2 scales between lateral lines.

***Crenicichla alta* Eigenmann**

- 4b. Humeral spot below lateral line; a dark band from snout passing through eye ending in humeral spot; sides of body dorsally sometimes with dark bars; chin darkish, middle not pale; dorsal rays XVII to XX, 13 to 16; anal III, 8 to 10; scale rows about 50 to 60; pores in lateral line 22 to 26 + 9 to 12; 3 or 4 scales from base of last dorsal spine to lateral line and 2 or 3 scales between lateral lines.

***Crenicichla saxatilis* (Linnaeus)**

- 3b. No humeral spot; dorsal rays XXII, 11; anal III, 8; scale rows about 57; pores in lateral line 24 + 10; scales between lateral line and last dorsal spine 4, and between lateral lines 2; a dark stripe from eye to operculum and sometimes dark blotches along middle of sides.

***Crenicichla geayi* Pellegrin**

- 2b. Maxillary reaching only to a vertical line through front of eye or not to front of eye.

- 5a. Maxillary not extending to a vertical line through front margin of eye; scale rows about 57; lateral line pores about 21 + 10; dorsal rays usually XX or XXI, 9 to 11; anal rays III, 7 to 9; scales from base of last dorsal spine to lateral line 2 and 3 between lateral lines; no humeral spot; a dark streak from snout past eye to caudal fading on caudal in adults; young with 7 or 8 dark cross bars on back.

***Crenicichla wallacii* Regan**

- 5b. Maxillary reaching to a vertical line through front margin of eye.

- 6a. Scale rows from upper edge of opercular opening to midcaudal fin base 62 to 70; pores in lateral line 23 to 25 + 11 to 13; 4 scales between base of last dorsal spine and lateral line, and 2 or 3 scales between lateral lines; dorsal rays XX to XXII, 10 to 13; anal rays III, 7 to 9; a dark stripe through eye to operculum; in young about 7 double cross bars; no distinct humeral spot; ocellated caudal spot at least in young-----

***Crenicichla macrophthalmia* Heckel**

- 6b. Scale rows 106 to 113; pores in lateral line 25 to 27 + 14 or 15; 10 or 11 scales from last dorsal spine to lateral line and 4 to 6 scales between lateral lines; black spot at base of middle caudal rays; young with lines of black dots-----

***Crenicichla lugubris* Heckel**

CRENICICHLA JOHANNA Heckel

Crenicichla johanna HECKEL, Ann. Wien. Mus. Naturg., vol. 2., p. 425, 1840 (Río Guaporé).—REGAN, Proc. Zool. Soc. London, 1905, pt. 1, p. 168 (Venezuela).—IHERING, Rev. Mus. Paulista, vol. 7, p. 307, 1907 (Venezuela).—EIGENMANN and ALLEN, Fishes of western South America, p. 406, 1942 (Venezuela).

CRENICICHLA ALTA Eigenmann

Crenicichla alta EIGENMANN, Mem. Carnegie Mus., vol. 5, p. 516, pl. 68, fig. 3, 1912 (Gluck Island and other localities in British Guiana).

One specimen, 51 mm., from near Caripito, William Beebe.

The above specimen lacks the humeral spot, but the black lateral band is prominent; ocellated black caudal spot at base of caudal fin rays above end of lateral line. The following counts were made: Dorsal rays XVIII, 15; anal III, 9; scale rows 58, pores in lateral line 24 + 11.

CRENICICHLA SAXATILIS (Linnaeus)

Sparus saxatilis LINNAEUS, *Systema naturae*, ed. 10, p. 278, 1758 (Surinam) (ref. copied).

Crenicichla saxatilis REGAN, *Proc. Zool. Soc. London*, 1906, pt. 1, p. 391 (Rio Grande do Sul to Venezuela; Trinidad).

Two specimens, 91 and 112 mm., Caripito, William Beebe, May 7, 1942.

CRENICICHLA GEAYI Pellegrin

MATOGUARO

Crenicichla geayi PELLEGRIN, *Bull. Mus. Hist. Nat. Paris*, vol. 9, p. 123, 1903 (Venezuela); *Mem. Soc. Zool. France*, vol. 16, p. 375, 1903 (Venezuela).—REGAN, *Proc. Zool. Soc. London*, 1905, pt. 1, p. 161 (near Bogotá; Río Orinoco).—EIGENMANN, *Indiana Univ. Stud.*, vol. 7, No. 44, p. 13, 1920 (Concejo, Río Tiquirito; Isla del Buro; Maracay, Río Bue; Río Castaño—all Venezuela).—PEARSE, *Univ. Wisconsin Studies*, No. 1, pp. 20, 43, 1920 (Isla del Buro and Río Castaño, Lake Valencia, Venezuela).—RÖHL, *Fauna descriptiva de Venezuela*, p. 384, 1942 (Venezuela).

The records for this species for the upper Orinoco system should be rechecked to determine if they have been confused with *macrophthalma*.

CRENICICHLA WALLACII Regan

Crenicichla wallacii REGAN, *Proc. Zool. Soc. London*, 1905, pt. 1, p. 163, pl. 14, fig. 2 (Río Essequibo; Río Negro).

CRENICICHLA MACROPHTHALMA Heckel

Crenicichla macrophthalma HECKEL, *Ann. Wien. Mus. Naturg.*, vol. 2, p. 427, 1840 (Río Negro).—PETERS, *Monatsb. Akad. Wiss. Berlin*, 1877, p. 469 (Calabozo).—SACHS, *Aus den Llanos*, 1879, p. 127 (Calabozo).—EIGENMANN AND EIGENMANN, *Proc. U. S. Nat. Mus.*, vol. 14, p. 70, 1891 (Orinoco).

The following collections were made in Venezuela during 1942:

U.S.N.M. No. 121658, 2 specimens, 42 and 50 mm. in standard length, Río Guárico and tributaries between San Sebastián and San Casimiro, L. P. Schultz, G. Zuloaga, William Phelps, Jr., R. Sherman, May 12.

3 specimens, 41 to 63 mm., near Caripito, Dr. William Beebe.

The above specimens are referred to this species with some uncertainty since the numbers of fin rays do not exactly agree and both collections may represent new subspecies of *macrophthalma*. The specimens from the Río Guárico have the following counts: Dorsal rays XXI, 13, XXII, 12; anal rays III, 7 and III, 8 while those from near Caripito have XXII, 11; XXII, 12; XXII, 12; anal rays III, 9; III, 9; III, 9. The number of scale rows are about 62 to 64 in both collections and 26 scales in a zig-zag row around caudal peduncle. The coloration in all specimens consists of about 7 blackish doubled crossbars, the middle of each dark bar is pale; ocellated caudal spot prominent; a dark band past eye to end of opercle, thence represented along anterior midside by intensification of pigment in each bar, interspaces pale; no humeral spot; caudal fin slightly barred or plain.

CRENICICHLA LUGUBRIS Heckel

Crenicichla lugubris HECKEL, Ann. Wien. Mus. Naturg., vol. 2, p. 422, 1840 (Rio Negro).—REGAN, Proc. Zool. Soc. London, 1905, pt. 1, p. 165 (Brazil; Guiana; Venezuela).

Genus ACARONIA Myers

Acaronia MYERS, Stanford Ichthyol. Bull., vol. 1, No. 5, p. 170, 1940 (replaces *Acaropsis* Steindachner, preoccupied). (Genotype, *Acara nassa* Heckel.)
Acaropsis STEINDACHNER, Sitzb. Akad. Wiss. Wien, vol. 71, p. 99, 1875. (Genotype, *A. nassa* Heckel.)

ACARONIA NASSA (Heckel)

Acara nassa HECKEL, Ann. Wien. Mus. Naturg., vol. 2, p. 353, 1840 (Rio Guaporé).
Acaronia nassa EIGENMANN AND ALLEN, Fishes of western South America, p. 388, 1942 (Orinoco).

Genus NANNACARA Regan

Nannacara REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 15, p. 344, 1905. (Genotype, *Nannacara anomala* Regan.)

NANNACARA ANOMALA Regan

Nannacara anomala REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 15, p. 344, 1905 (Rio Essequibo).

Three specimens, 27 to 31 mm. in standard length, from Caripito, William Beebe, 1942.

TABLE 19.—*Counts of fin rays made on Nannacara anomala Regan*

Locality	Dorsal				Anal		
	XVI, 7	XVI, 8	XVII, 7	XVII, 8	III, 7	III, 8	IV, 7
Caripito.....	1		2				3
? British Guiana. U.S.N.M. No. 94919.....	3	1		1	3	1	1

Genus AEQUIDENS Eigenmann and Bray²²

Aequidens EIGENMANN AND BRAY, Ann. New York Acad. Sci., vol. 7, p. 616, 1894. (Genotype, *Acara tetramerus* Heckel.)

KEY TO THE SPECIES OF AEQUIDENS REPORTED OR EXPECTED TO OCCUR IN VENEZUELA

- 1a. Two or 2½ scales between base of first soft ray of dorsal fin and lateral line; the blackish lateral streak or band, if present, extending from eye through black lateral blotch to upper half of base of caudal fin rays; gill rakers 2 or 3 + 5 or 6 on first arch.
- 2a. Base of caudal fin rays with a prominent black spot, about one-half size of eye, located entirely above midaxis of caudal fin or lateral line if it extends on base of fin.

²² As here understood, *Acara* Heckel, 1840, with its type restricted by Gill to *Acara crassispinis* Heckel = *Lobotes ocellatus* Agassiz, is a synonym of *Astronotus* Swainson, 1839, with its type, *Lobotes ocellatus* Agassiz, the only species mentioned. Thus, in Regan's revision of the South American cichlid genera, his use of *Acara* is a synonym of *Aequidens*.

- 3a. Dorsal rays usually XV or XVI, 10; anal rays III, 8 to 10, usually III, 8 or 9; a dark blotch present under rear of eye; usually 2.5 scales between lateral line and base of first soft ray of dorsal (Amazon, Río Negro, and Guianas)-----**Aequidens tetramerus** (Heckel)
- 3b. Dorsal rays XIV or XV, 11 or 12; anal III, 8 to 10; a dark bar under rear margin of eye extending downward parallel with edge of preopercle; usually 2 scales above lateral line to first soft ray of dorsal fin (Río Meta)-----**Aequidens metae** ²³ Eigenmann
- 2b. Base of caudal fin with a rather wide dark bar, this bar usually more intensely pigmented above the lateral line than below it, the lateral band meeting this bar in its upper half at base of upper caudal fin rays; a dark bar under eye extending toward lower preopercular angle; dorsal rays XIV, 9 or 10; anal rays III, 7 or 8 (British Guiana).
Aequidens potaroensis ²³ Eigenmann
- 1b. One and one-half scales between base of first soft ray of dorsal fin and lateral line; blackish lateral streak, if present, extending from eye through black lateral blotch to rear of base of soft dorsal fin or anterior upper edge of caudal peduncle; base of caudal fin with a small to large blackish bar sometimes obscure, except at lateral line, usually a little more developed above lateral line than below lateral line or at midaxis of caudal fin; no black spot at base of upper rays of caudal fin; a dark bar or oblong spot, extending from below eye toward lower preopercular angle; gill rakers 2 or 3 + 5 or 6 on first arch.
- 4a. Caudal fin base with a bar or with an obscure spot at end of lateral line.
- 5a. The blackish lateral band prominent and extending forward to upper rear edge of orbit, thence across top of head, meeting its fellow between rear margins of orbit; lateral blotch lacking, vertical color bars barely visible; dorsal rays XIV, 9 or 10; anal rays III, 7 or 8; caudal blotch present near end of lateral line on base of caudal fin rays (Río Meta).
Aequidens mariaae ²³ Eigenmann
- 5b. Vertical bars more prominent than lateral band, the latter indistinct or absent between rear of eyes on dorsal surface of head; lateral blotch usually obvious; fifth dorsal spine equal to or a little shorter than tenth dorsal spine (Trinidad to Colombia)-----**Aequidens pulcher** (Gill)
- 4b. Upper half of caudal fin base with a large prominent spot half size of eye; fifth dorsal ray longer than tenth dorsal ray.
Aequidens vittata ²³ (Heckel)

AEQUIDENS TETRAMERUS (Heckel)

Acara tetramerus HECKEL, Ann. Wien Mus. Naturg., vol. 2, p. 341, 1840.

Acara diadema HECKEL, Ann. Wien Mus. Naturg., vol. 2, p. 344, 1840 (Río Negro in Venezuela).

AEQUIDENS PULCHER (Gill)

MOJARRO

Cychlasoma pulchrum GILL, Ann. Lyceum Nat. Hist. New York, vol. 6, p. 382 (22), 1858 (Trinidad).

Aequidens latifrons EIGENMANN, Mem. Carnegie Mus., vol. 9, No. 1, p. 197, pl. 33, fig. 1, 1922 (Colombia and Panama, in Magdalena, Atrato, and San Juan Basins).—MYERS, Stanford Ichthyol. Bull., vol. 2, No. 4, p. 114, 1942 (Quebrado Sargento, tributary Río Limón, north of Maracaibo).

Aequidens pulcher EIGENMANN, Indiana Univ. Studies, vol. 7, No. 44, p. 13, 1920 (Isla del Buro, Lago Valencia; Maracay, Río Bue, Venezuela).—PEARSE,

²³ Not yet reported from Venezuela.

Univ. Wisconsin Studies, No. 1, p. 18, 1920 (mouth Río Bue, Lake Valencia, Venezuela).

Aequidens tetramerus BEEBE, in part, Zoologica, vol. 28, No. 3, pp. 13-16, pl. 1, 1943 (Caripito, Venezuela).

Acara vittata IHERING, Rev. Mus. Paulista, vol. 7, p. 310, 1907 (Río Cabriales, Venezuela).

Acara pulchra PELLEGRIN, Mem. Soc. Zool. France, vol. 16, p. 176, 1903 (Maracaibo).—REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 15, p. 335, 1905 (Venezuela); Proc. Zool. Soc. London, 1906, pt. 1, p. 392, pl. 25, fig. 1 (Venezuela).

Aequidens vittata FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 95, p. 264, 1943 (Cúcuta, Colombia, Maracaibo Basin). (The other specimen listed by Fowler from Florencia, Colombia, probably is not *vittata*.)

U.S.N.M. No. 121639, 81 specimens, 11 to 83 mm., from the Río San Pedro at bridge, Motatán system, March 20, 1942.

U.S.N.M. No. 121651, 108 specimens, 10 to 79 mm., Río San Juan near bridge, south of Mene Grande, March 17 and 20, 1942.

U.S.N.M. No. 121638, 7 specimens, 17.5 to 38 mm., Río Apón, about 35 km. south of Rosario, February 26, 1942.

U.S.N.M. No. 121642, 12 specimens, 11 to 98 mm., Lago Tulé, about 75 km. west of Maracaibo, March 1, 1942.

U.S.N.M. No. 121640, 2 specimens, Río San Ignacio, pool in drying up stream, 20 km. south of Rosario, February 26, 1942.

U.S.N.M. No. 121645, 4 specimens, 25 to 71 mm., Río Motatán, 8 km. below Motatán, March 24, 1942.

U.S.N.M. No. 121643, 6 specimens, 16 to 23 mm., Río Socuy, 3 km. above mouth, February 24, 1942.

U.S.N.M. No. 121657, 46 specimens, 21 to 101 mm., caño $\frac{1}{2}$ mile west of Sinamaica, March 11, 1942.

U.S.N.M. No. 121647, 30 specimens, 11 to 79 mm., Río Machango at bridge south of Lagunillas, March 16, 1942.

U.S.N.M. No. 121650, 7 specimens, 20 to 57 mm., Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21, 1942.

U.S.N.M. No. 121655, 13 specimens, 61 to 80 mm., Salina Rica (brackish water), 5 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121656, a specimen, 10 mm., Caño de Sagua, 25 km. north of Sinamaica (salt water), March 12, 1942.

U.S.N.M. No. 121653, 15 specimens, 11 to 74 mm., Río Negro below mouth of Río Yasa, March 2, 1942.

U.S.N.M. No. 121654, 5 specimens, 17 to 25 mm., in creek below warm spring tributary to Río Machango, 20 km. above bridge south of Lagunillas, March 21, 1942.

U.S.N.M. No. 121644, 10 specimens, 26 to 50 mm., Río Machango, 20 km. above bridge south of Lagunillas, March 21, 1942.

U.S.N.M. No. 121646, 40 specimens, 16 to 65 mm., Río San Juan at bridge south of Rosario, February 26, 1942.

U.S.N.M. No. 121637, 2 specimens, 15 and 15.5 mm., Lago de Maracaibo opposite Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121648, 25 specimens, 8 to 81 mm., Ciénaga del Guanavana about 10 km. north of Sinamaica, March 11, 1942.

U.S.N.M. No. 121641, 4 specimens, 28 to 37 mm., Lago de Maracaibo at Maracaibo Yacht Club, February 27, 1942.

U.S.N.M. No. 121652, 4 specimens, 19 to 28 mm., Río Palmar at bridge, 70 km. southwest of Maracaibo, March 6, 1942.

U.S.N.M. No. 121649, 7 specimens, 13 to 33 mm., pond tributary to Río Gé, near Rosario, L. P. Schultz, W. W. Butcher, and B. C. Refshauge, March 8, 1942.

U.S.N.M. No. 121636, 16 specimens, 32 to 74 mm., Río Guárico and tributaries, between San Sebastián and San Casimiro, L. P. Schultz, G. Zuloaga, William Phelps, Jr., and R. Sherman, May 12, 1942.

The following collections were made by Brother Nicéforo María in the Catatumbo system of the Maracaibo Basin:

U.S.N.M. No. 100780, 1 specimen, 21 mm., Cúcuta, Colombia.

U.S.N.M. No. 101618, 1 specimen, 109 mm., Río Pamplonita, near Cúcuta.

I have examined the five specimens, 64 to 75 mm., from Caripito, collected by Dr. William Beebe, March 21, 1942, and reported upon by him (1943b) as *A. tetramerus* and I refer them to this species.

The Chicago Natural History Museum lent for report one specimen, their No. 42009, Río Cogollo, Sierra Perijá, Osgood and Conover, March 1920.

Color when alive consisted of several short irregular iridescent blue wavy lines below eye on operculum and lower side of head; the scales on front of body have bluish iridescent reflections; there is an orange tinge in the pale interspaces between the blackish vertical bars.

Genus PETENIA Günther

Petenia GÜNTHER, Catalogue of the fishes in the British Museum, vol. 4, p. 301, 1862. (Genotype, *Petenia splendida* Günther.)

Coquetaia FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 97, p. 133, 1945. (Genotype, *Coquetaia amploris* Fowler.)

PETENIA KRAUSSII Steindachner

Petenia kraussii STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 39, p. 28, pl. 1, figs. 2, 3, pl. 2, fig. 1, 1a, 1b, 1878 (Río Magdalena).—PELLEGRIN, Mem. Soc. Zool. France, vol. 16, p. 244, 1903 (Maracaibo).

Cichlosoma kraussi REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 16, p. 339, 1905 (Venezuela).

Cichlasoma kraussi MYERS, Stanford Ichthyol. Bull., vol. 2, No. 4, p. 114, 1942 (Quebrada Sargento tributary to Río Limón, north of Maracaibo).

U.S.N.M. No. 121625, 4 specimens, 71 to 127 mm. in standard length, Río San Juan near bridge south of Lagunillas, March 17 and 20, 1942.

U.S.N.M. No. 121628, 6 specimens, 35 to 103 mm., Lago de Maracaibo at Yacht Club, in brackish water, February 27 and March 5, 1942.

U.S.N.M. No. 121632, 2 specimens, 89 and 101 mm., Río San Pedro at bridge south of Lagunillas, March 20, 1942.

U.S.N.M. No. 121627, 8 specimens, 18 to 130 mm., Río Apón about 35 km. south of Rosario, February 26, 1942.

U.S.N.M. No. 121626, 78 specimens, 16 to 110 mm., Río Machango at bridge south of Lagunillas, March 16, 1942.

U.S.N.M. No. 121633, 4 specimens, 77 to 118 mm., Salina Rica, 5 km. north of Maracaibo in brackish water, February 20, 1942.

U.S.N.M. No. 121634, 1 specimen, 21 mm., Río Agua Caliente, 2 to 3 km. above Lago Maracaibo, May 1, 1942.

U.S.N.M. No. 121630, 37 specimens, 40 to 106 mm., Río Socuy, 3 km. above mouth, February 24, 1942.

U.S.N.M. No. 121631, 46 specimens, 13 to 48 mm., Río Machango, 20 km. above bridge, south of Lagunillas, March 21, 1942.

U.S.N.M. No. 121629, 57 specimens, 12 to 106 mm., Lago Tulé about 75 km. west of Maracaibo, March 1, 1942.

U.S.N.M. No. 121624, 3 specimens, 110 to 140 mm., Lago de Maracaibo, 7 km. south of Maracaibo, March 6, 1942.

U.S.N.M. No. 121635, 4 specimens, 14 to 34 mm., pond tributary to Río Gé, near Rosario, March 8, 1942.

U.S.N.M. No. 121619, 15 specimens, 15 to 170 mm., Río Negro below mouth of Río Yasa, March 2, 1942.

U.S.N.M. No. 121623, 16 specimens, 17 to 96 mm., Río Palmar at bridge 70 km. southwest of Maracaibo, March 6, 1942.

U.S.N.M. No. 121621, 28 specimens, 10 to 143 mm., Ciénaga del Guanavana about 10 km. north of Sinamaica, March 11, 1942.

U.S.N.M. No. 121622, 49 specimens, 30 to 171 mm., caño $\frac{1}{2}$ mile west of Sinamaica, March 11, 1942.

TABLE 20.—*Measurements and counts made on species of Petenia (all measurements expressed in hundredths of the standard length)*

Characters	myersi		kraussi
	Holotype	Paratype	Maracaibo Basin, Venezuela
Standard length in millimeters.....	137.0	65.0	149.5
Length of head.....	37.9	40.0	40.1
Greatest depth of body.....	43.1	46.9	43.5
Length of snout.....	14.6	13.1	12.5
Diameter of eye.....	8.61	11.5	9.16
Width of interorbital space.....	10.2	9.23	10.7
Least width of preorbital.....	4.89	4.62	4.68
Postorbital length of head.....	15.7	16.9	19.1
Snout tip to rear end of maxillary.....	24.1	-----	20.1
Snout to nostril.....	10.9	-----	9.36
Eye to nostril.....	3.65	3.08	3.34
Length of caudal peduncle.....	17.7	14.2	13.0
Least depth of caudal peduncle.....	14.2	13.8	14.8
Length of fifth dorsal spine.....	12.4	16.5	12.0
Length of last dorsal spine.....	12.4	-----	16.1
Longest ray of pelvics.....	31.0	31.5	34.1
Longest ray of pectorals.....	21.5	24.9	30.4
Distance out that caudal fin is scaled basally.....	13.9	11.5	21.4
Longest caudal fin ray.....	25.5	26.2	31.8
Dorsal rays.....	XV, 13	XV, 13	XVI, 11
Anal rays.....	V, 9	V, 9	VI, 10
Pectoral rays.....	ii, 13-ii, 13	ii, 13-ii, 13	ii, 13-ii, 13
Pelvic rays.....	I, 5-I, 5	I, 5-I, 5	I, 5-I, 5
Branched caudal fin rays.....	14	14	14
Scale rows below lateral line.....	32	32	32
Scales from dorsal origin to lateral line.....	6	6	7
Scales from pelvic base to lateral line.....	12	12	13
Pores in lateral line.....	18+13	18+11	20+10
Scales between lateral lines.....	2	2	2
Scales from base of last dorsal spine to lateral line and on base of dorsal.....	5+2	5+2	4+2
Zigzag row of scales around caudal peduncle.....	20	20	20

U.S.N.M. No. 121620, 98 specimens, 26 to 139 mm., Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21, 1942.

Recently I described (Schultz, 1944d) a new species of *Petenia* from Colombia. In table 20 the species *P. kraussi* and *P. myersi* Schultz are compared. H. W. Fowler (Proc. Acad. Nat. Sci. Philadelphia, vol. 97, pp. 133–135, figs. 46, 47, 1945) described *Coquetaia amploris* from the Río Coquetá, but this is a synonym of *Petenia myersi* Schultz; they came from the same river.

TABLE 21.—*Fin ray counts made on Petenia kraussii from the Maracaibo Basin*

Dorsal rays			Anal rays		
XV, 10	XV, 11	XVI, 11	VI, 8	VI, 9	VII, 8
4	1	14	4	14	1

Genus CICHLASOMA Swainson

Cichlaurus SWAINSON, The natural history of fishes, vol. 2, p. 173, 1839 (no species listed).

Cichlasoma SWAINSON, The natural history of fishes, p. 230, 1839. (Genotype, *Labrus punctata* Bloch.)

KEY TO THE SPECIES OF CICHLASOMA

1a. Anal rays usually IV, 8 to 9; dorsal rays usually XV, 9 to 11; depth of body 1.75 to 2.5, head $2\frac{2}{3}$ to 3; caudal rounded; a dark spot below rear of eye; black caudal spot on upper part of base of caudal fin and on base of upper caudal fin rays; a black band from eye to the black lateral blotch; about 8 blackish vertical bars, sometimes obscure.

Cichlasoma bimaculatum (Linnaeus)

1b. Anal rays usually V, 8 to 10; dorsal rays XV, 12 or 13; depth of body 2, head 2.75; caudal rounded; a lengthwise band from eye to caudal base where it forms a spot----- *Cichlasoma psittacum* (Heckel)

CICHLASOMA BIMACULATUM (Linnaeus)

Labrius bimaculatus LINNAEUS, Systema naturae, ed. 10, p. 285, 1758.

Cichlasoma bimaculatum REGAN, Proc. Zool. Soc. London, 1906, pt. 1, p. 392 (Venezuela).

Aequidens tetramerus (in part) BEEBE, Zoologica, vol. 28, No. 3, pp. 13–16, pl. 1, 1943 (Caripito, Venezuela).

Acara bimaculata PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 158, 1899 (Apure River, Venezuela).

Three specimens, 19 to 60 mm., Caripito, William Beebe, 1942.

CICHLASOMA PSITTACUM (Heckel)

Heros psittacus HECKEL, Ann. Wien. Mus. Naturg., vol. 2, p. 369, 1840.

Cichlasoma psittacum REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 16, p. 324, 1905 (Río Orinoco).—HASEMAN, Ann. Carnegie Mus., vol. 7, p. 343, 1911 (Orinoco rivers).

Family POMACENTRIDAE: Desmoiselles; Damselfishes

Genus ABUDEFDUF Forskål

Abudefduf FORSKÅL, Descriptiones animalium, p. 59, 1775. (Genotype, *Chaetodon sordidus* Forskål.)

ABUDEFDUF SAXATILIS (Linnaeus)

Chaetodon saxatilis LINNAEUS, Systema naturae, ed. 10, p. 276, 1758 ("India").

Abudefduf saxatilis marginatus METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 100, 1919 (La Guaira, Venezuela).

Family LABRIDAE: Wrasses

Genus HALICHOERES Rüppell

Halichoeres RÜPPELL, Neue Wirbelthiere, Fische, p. 14, 1835. (Genotype, *Halichoeres bimaculatus* Rüppell.)

HALICHOERES RADIATUS (Linnaeus)

DONCELLA

Labrus radiatus LINNAEUS, Systema naturae, ed. 10, p. 288, 1758 (America).

Halichoeres radiatus RÖHL, Fauna descriptiva de Venezuela, p. 408, fig. 225, 1942 (coast of Venezuela; Lago de Maracaibo).

Genus LACHNOLAIMUS Valenciennes

Lachnolaimus VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 13, p. 200, 1839. (Genotype, *L. aigula* Cuvier and Valenciennes = *Labrus maximus* Walbaum).

LACHNOLAIMUS MAXIMUS (Walbaum)

PERRO

Labrus maximus WALBAUM, Artedi's Bibliotheca ichthyologica, vol. 3, p. 261, 1792.

Lachnolaimus maximus RÖHL, Fauna descriptiva de Venezuela, p. 408, fig. 224, 1942 (coast of Venezuela).

Genus BODIANUS Bloch

Bodianus BLOCH, Naturgeschichte der ausländischen Fische, vol. 4, p. 48, 1790. (Genotype, *Bodianus bodianus* Bloch.) (Ref. copied.)

BODIANUS RUFUS (Linnaeus)

Labrus rufus LINNAEUS, Systema naturae, ed. 10, p. 284, 1758 (America).

Cossyphus rufus METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 103, 1919 (Puerto Cabello, Venezuela)

Family SCARIDAE: Parrotfishes; Loros

No key is attempted for this family because there are too few specimens available from Venezuelan waters. The reader is referred to Meek and Hildebrand's "The Marine Fishes of Panama," part 3, pp. 732 to 760, 1928 for keys that will aid in the identification of the

parrotfishes. Also see Longley and Hildebrand's "Systematic Catalogue of the Fishes of Tortugas, Florida," Carnegie Institution of Washington Publication No. 535, pp. 205-221, 1941. I am listing below the species reported from Venezuela without attempting to straighten out the synonymy.

Genus SPARISOMA Swainson

Sparisoma SWAINSON, The natural history and classification of fishes, vol. 2, p. 227, 1839. (Genotype, *Sparus abildgaardi* Bloch.)

The following collection I am unable to identify with certainty down to species:

U.S.N.M. No. 123176, 7 specimens, 27 to 40 mm., Estanques Bay, U. S. S. Niagara, February 20, 1925.

SPARISOMA ABILDGAARDI (Bloch)

Sparus abildgaardi BLOCH, Naturgeschichte der ausländischen Fische, vol. 5, p. 22, pl. 259, 1791 (America) (ref. copied).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 112, 1919 (Venezuela).

SPARISOMA FLAVESCENS (Bloch and Schneider)

Scarus flavescens BLOCH AND SCHNEIDER, Systema ichthyologiae, p. 290, 1801 (Cuba).

U.S.N.M. No. 123175, 4 specimens, 29 to 70 mm., from Cape San Román, U. S. S. Niagara, April 2, 1925.

Genus SCARUS Forskål

Scarus FORSKÅL, Descriptiones animalium, p. 25, 1775. (Genotype, *Scarus psittacus* Forskål.)

SCARUS PUNCTULATUS (Cuvier and Valenciennes)

Scarus punctulatus CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 14, p. 195, 1839 (Martinique).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 115, 1919 (Puerto Cabello, Venezuela).

SCARUS CROICENSIS Bloch

Scarus croicensis BLOCH, Naturgeschichte der ausländischen Fische, vol. 4, p. 27, pl. 221, 1790 (St. Croix).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 116, 1919 (Venezuela).

SCARUS EVERMANNI Jordan

Scarus evermanni JORDAN, in Jordan and Evermann, Proc. U. S. Nat. Mus., vol. 9, p. 469, 1887 (Snapper Banks off Tampa Bay).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 116, 1919 (Venezuela).

Longley and Hildebrand (see reference above) suggest this species may be *Scarus croicensis*.

SCARUS VIRIDIS (Bonnaterre)**LORO**

Scarus viridis BONNATERRE, Tableau encyclopédique, Ichthyologie, vol. 6, p. 96, 1788 (Bahamas) (ref. copied).

Sparisoma viridis RÖHL, Fauna descriptiva de Venezuela, p. 409, 1942 (coast of Venezuela).

Suborder BLENNIOIDEA**Family CLINIDAE: Blennies**

The specimens and number of species from Venezuela are too few to warrant the construction of a key for their identification. Instead, the reader is referred to Meek and Hildebrand's "The Marine Fishes of Panama," part 3, pp. 928-953, 1928, and to Longley and Hildebrand's "Systematic Catalogue of the Fishes of Tortugas, Florida," Carnegie Inst. Washington Publ. No. 535, pp. 246-276, 1941, for aid in identification of the blennies likely to occur in Venezuela.

Genus LABRISOMUS Swainson

Labrisomus SWAINSON, The natural history and classification of fishes, vol. 2, p. 277, 1839. (Genotype, *Clinus pectinifer* Cuvier and Valenciennes=*Clinus nuchipinnis* Quoy and Gaimard.) (Ref. copied.)

LABRISOMUS NUCHIPINNIS (Quoy and Gaimard)

Clinus nuchipinnis QUOY AND GAIMARD, Voyage autour du monde . . . *L'Uranie* et *La Physicienne*, p. 255, 1824 (Rio de Janeiro) (ref. copied).—METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies 1904-1905, p. 154, 1919 (Venezuela).

U.S.N.M. Nos. 78251 and 78252, Puerto Cabello, J. N. Rose.

U.S.N.M. No. 123173, 1 specimen, 46.5 mm., Estanques Bay, U. S. S. *Niagara*, February 20, 1925.

U.S.N.M. No. 123174, 1 specimen, 61 mm., Cape San Román, U. S. S. *Niagara*, April 2, 1925.

Genus PARACLINUS Mocquard

Paraclinus MOCQUARD, Bull. Soc. Philom. Paris, ser. 8, vol. 1, No. 1, p. 41, 1889 (substitute name for *Acanthoclinus* Mocquard, 1886. (Genotype, *Acanthoclinus chaperi* Mocquard.)

For synonymy of this genus see Storey (1940, pp. 85-86).

PARACLINUS NIGRIPINNIS (Steindachner)

Clinus nigripinnis STEINDACHNER, Sitzb. Akad. Wiss. Wien, vol. 50, p. 45, 1867 (Barbados).

U.S.N.M. No. 123172, a specimen, 34 mm., from Cape San Román, U. S. S. *Niagara*, April 2, 1925.

PARACLINUS CHAPERI (Mocquard)

Acanthoclinus chaperi MOCQUARD, Bull. Soc. Philom. Paris, ser. 7, vol. 10, pp. 18-20, 1886 (Guanta Bay, near Barcelona, Venezuela).—Storey, Copeia, No. 2, p. 82, 1940 (Guanta Bay).

Paraclinus chaperi METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies, 1904-1905, p. 156, fig. 50, 1919 (Venezuela).—Storey, Copeia, No. 2, pp. 82, 86, 1940 (Guanta Bay, near Barcelona, Venezuela).

Genus MALACOTENUS Gill

Malacotenus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1860, p. 103. (Genotype, *Clinus delalandii* Cuvier and Valenciennes.)

MALACOTENUS DELALANDII (Valenciennes)

Clinus delalandii VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 11, p. 378, 1836 (Brazil).

U.S.N.M. No. 123171, 5 specimens, 37.5 to 55 mm., Cape San Román, U. S. S. *Niagara*, April 2, 1925.

U.S.N.M. No. 123170, 2 specimens, dried, 45 and 52 mm., Gulf of Venezuela, U. S. S. *Niagara*, April 4, 1925.

Suborder TRICHIUROIDEA

Family TRICHIURIDAE: Hairtails

Genus TRICHIURUS Linnaeus

Trichiurus LINNAEUS, Systema naturae, ed. 10, p. 246, 1758. (Genotype, *Trichiurus lepturus* Linnaeus.)

TRICHIURUS LEPTURUS Linnaeus

Trichiurus lepturus LINNAEUS, Systema naturae, ed. 10, p. 246, 1758 (America).—RÖHL, Fauna descriptiva de Venezuela, p. 396, fig. 207, 1942 (coast of Venezuela).

U.S.N.M. No. 123079, 3 specimens, 180 to 193 mm. in total length, from Jacuque Point, U. S. S. *Niagara*, January 26, 1925.

Suborder SCOMBROIDEA

Family SCOMBRIDAE

The Venezuelan material of this family is so limited that I have not attempted to make a key. Instead I am copying the "Key to the Genera" which appears on pages 307-308, part I, of Meek and Hildebrand's "The Marine Fishes of Panama." This key includes those genera of scombroid fishes most likely to be found along the coast of Venezuela.

1a. Maxillary wholly concealed by preorbital; no median keel on caudal peduncle.

Scomber²⁴ Linnaeus

1b. Maxillary not wholly concealed by preorbital; median keel on caudal peduncle more or less developed.

2a. Scales present on anterior part of body only, forming a corselet, the rest of body naked; palatine teeth wanting.

3a. Dorsal fins close together, contiguous; the first with XV or XVI spines.

Gymnosarda²⁴ Gill

3b. Dorsal fins far apart, the interval between them nearly equaling the length of the head; the first with IX or X spines.----**Auxis**²⁴ Cuvier

²⁴ Not yet recorded from Venezuela.

- 2b. Entire body covered with scales, sometimes very small or rudimentary, forming a corselet or not; palatine teeth present.
- 4a. Snout of moderate length, not beaklike; maxillary posteriorly exposed, not concealed by preorbital.
- 5a. Teeth on jaws small, conical, not compressed; gill rakers long and slender, numerous, 20 or more on lower limb of first arch.
- 6a. Body oblong, compressed, not exceptionally robust; pectoral fins of moderate length, always notably shorter than head.

Thunnus South

- 6b. Body short, slightly compressed, very robust; pectoral fins of extreme length, much longer than head-----**Germo**²⁴ Jordan
- 5b. Teeth on jaws rather strong, more or less compressed, sometimes triangular, with sharp cutting edges; gill rakers rather short, fewer than 20 on lower limb of first arch.
- 7a. Vomer toothless; palatine teeth in a single series, similar in size and shape to those on jaws; first dorsal long, with XVIII to XXII spines; scales of pectoral region forming a rather distinct corselet -----**Sarda** Cuvier
- 7b. Vomer and palatines with bands of granular teeth; first dorsal rather short, with XIV to XVIII feeble spines; scales not forming corselet -----**Scomberomorus** Lacépède
- 4b. Snout extremely long, beaklike, longer than rest of head; maxillary posteriorly concealed by preorbital-----**Acanthocybium** Gill

Genus THUNNUS South

Thunnus SOUTH, Encyclopedia metropolitana, vol. 5, p. 620, 1845. (Genotype *Scomber thynnus* Linnaeus.) (Substitute for *Thynnus* Cuvier, preoccupied.) (Ref. copied.)

THUNNUS THYNNUS (Linnaeus)**TUNA; ALBACORA O ATÚN**

Scomber thynnus LINNAEUS, Systema naturae, ed. 10, p. 297, 1758 (Europe).

Thunnus thynnus RÖHL, Fauna descriptiva de Venezuela, p. 394, fig. 203, 1942 (coast of Venezuela).

Genus SARDA Cuvier

Sarda CUVIER, Le règne animal, ed. 2, vol. 2, p. 199, 1829. (Genotype, *Scomber sarda* Bloch.)

SARDA SARDA (Bloch)**BONITO**

Scomber sarda BLOCH, Ichthyologie, ou Histoire naturelle des poissons, vol. 10, p. 35, pl. 334, 1797 (Europe).

Sarda sarda RÖHL, Fauna descriptiva de Venezuela, p. 394, 1942 (off coast of Venezuela).

Genus SCOMBEROMORUS Lacépède

Scomberomorus LACEPÈDE, Histoire naturelle des poissons, vol. 3, p. 292, 1802. (Genotype, *Scomberomorus plumieri* Lacépède=*Scomber regalis* Bloch).

²⁴Not yet recorded from Venezuela.

KEY TO THE SPECIES OF SCOMBEROMORUS LIKELY TO OCCUR ALONG THE COAST OF VENEZUELA ²⁵

- 1a. Body very slender, its depth 5.5 to 6.25 in its length; gill rakers extremely short, not more than one-fourth length of eye in adult, 7 or 8 more or less developed on lower limb of first arch; lateral line with an abrupt downward curve under second dorsal; sides in adult plain silvery, without spots or streaks, in young with yellowish spots; dorsal rays about XIV, 17,9; anal II,14 to 17,9 or 10-----**Scomberomorus cavalla** ²⁶ (Cuvier)
- 1b. Body deeper, its depth usually less than 5.5 in its length; gill rakers longer, more numerous, about 10 to 12 on lower limb of first arch; lateral line descending gradually, not with an abrupt curve; sides with dark spots or dark streaks; dorsal rays about XVII or XVIII,15 to 18, 8 or 9; anal II,14 to 17,8 or 9.
- 2a. Pectoral fins covered with small scales almost to their tips; sides with one or two longitudinal dark streaks and a few rows of elliptical spots.
Scomberomorus regalis (Bloch)
- 2b. Pectoral fins without scales; sides with bronzy spots, but without dark streaks -----**Scomberomorus maculatus** (Mitchill)

SCOMBEROMORUS REGALIS (Bloch)

Scomber regalis BLOCH, Ichthyologie, ou Histoire naturelle des poissons, vol. 10, p. 31, pl. 333, 1797.

Scomberomorus regalis RÖHL, Fauna descriptiva de Venezuela, p. 395, fig. 206, 1942 (coast of Venezuela).

SCOMBEROMORUS MACULATUS (Mitchill)

SPANISH MACKEREL; CARITE

Scomber maculatus MITCHILL, Trans. Lit. Philos. Soc. New York, vol. 1, p. 426, 1815.

Scomberomorus maculatus RÖHL, Fauna descriptiva de Venezuela, p. 394, fig. 205, 1942 (coast of Venezuela).

U.S.N.M. No. 121802, 2 specimens, 280 and 312 mm., market at Maracaibo, May 15, 1942.

The following specimen was identified by Dr. S. F. Hildebrand:

U.S.N.M. No. 123081, 1 specimen, 340 mm., from Amuay Bay, May 15, 1925.

Genus ACANTHOCYBIUM Gill

Acanthocybium GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 125. (Genotype, *Cybius sara* Bennett.)

ACANTHOCYBIUM SOLANDRI (Cuvier)

WAHOO; PETO

Cybius solandri CUVIER, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 8, p. 192, 1831.

Acanthocybium solandri RÖHL, Fauna descriptiva de Venezuela, p. 394, fig. 204, 1942 (coast of Venezuela).

²⁵ Modified after Meek and Hildebrand.

²⁶ Not yet reported from Venezuela.

Family ISTIOPHORIDAE: Sailfishes

Genus ISTIOPHORUS Lacepède

Istiophorus LACEPÈDE, Histoire naturelle des poissons, vol. 3, p. 374, 1803.
(Genotype, *Istiophorus gladifer* Lacepède=*Scomber gladius* Broussonet.)
(Ref. copied.)

ISTIOPHORUS AMERICANUS (Cuvier and Valenciennes)

SAILFISH; AGUJA VELA

Istiophorus americanus CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 8, p. 303, 1831 (Brazil).

Istiophorus nigricans RÖHL, Fauna descriptiva de Venezuela, p. 396, fig. 208, 1942 (coast of Venezuela).

Family XIPHIIDAE: Swordfishes

Genus XIPHIAS Linnaeus

Xiphias LINNAEUS, Systema naturae, ed. 10, p. 248, 1758. (Genotype, *Xiphias gladius* Linnaeus.)

XIPHIAS GLADIUS Linnaeus

SWORDFISH; EMPERADOR, ESPADÓN, O PEZ ESPADA

Xiphias gladius LINNAEUS, Systema naturae, ed. 10, p. 248, 1758 (Europe).

Tetraopterus imperator RÖHL, Fauna descriptiva de Venezuela, p. 397, fig. 209, 1942 (coast of Venezuela).

Suborder STROMATEOIDEA

Family STROMATEIDAE: Harvestfishes

Genus PEPRILUS Cuvier

Peprilus CUVIER, Le règne animal, ed. 2, vol. 2, p. 214, 1829. (Genotype, *Stromateus longipinnis* Mitchill=*Stromateus paru* Linnaeus.)

PEPRILUS PARU (Linnaeus)

HARVESTFISH: PALOMETA DE MAR

Stromateus paru LINNAEUS, Systema naturae, ed. 10, p. 248, 1758 (America).

Peprilus paru RÖHL, Fauna descriptiva de Venezuela, p. 401, fig. 215, 1942 (coast of Venezuela).

U.S.N.M. No. 123044, 5 specimens, 54 to 68 mm. in standard length, Piedras Bay, U. S. S. Niagara, March 14, 1925.

Suborder GOBIFORMES

Upon my return from Venezuela in 1942 I turned over to Isaac Ginsburg for study all the gobiid fishes that I collected, along with a large collection made by Dr. F. F. Bond. All the identifications reported upon for the two following families, Eleotridae and Gobiidae, were made by Mr. Ginsburg, and to him I extend my appreciation of

his work and of the opportunity to include his identifications in this report. These specimens will be fully treated some time in the future in a big work on American gobies that he has been preparing for a number of years, and I shall not attempt to make a key to this group.

Family ELEOTRIDAE

Genus EROTELIS Poey

Erotelis POEY, *Memorias sobre la historia natural de la isla de Cuba*, vol. 2, p. 273, 1860. (Genotype, *E. valenciennesi* Poey = *Eleotris smaragdus* Cuvier and Valenciennes.)

EROTELIS SMARAGDUS (Cuvier and Valenciennes)

Eleotris smaragdus CUVIER AND VALENCIENNES, *Histoire naturelle des poissons*, vol. 12, p. 231, 1837 (Cuba).

U. S. N. M. No. 123145, 1 specimen, Point Macollo, U.S.S. *Niagara*, April 19, 1925.

Genus MICROPHILYPNUS Myers

Microphilypnus MYERS, *Bull. Mus. Comp. Zool.*, vol. 68, No. 3, p. 134. 1927. (Genotype, *Microphilypnus ternetzi* Myers.)

MICROPHILYPNUS TERNETZI Myers

Microphilypnus ternetzi MYERS, *Bull. Mus. Comp. Zool.*, vol. 68, No. 3, p. 134 1927 (Caño de Quiribana, near Caicara, Venezuela).

Genus DORMITATOR Gill

Dormitator GILL, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 14, p. 240, 1862. (Genotype, *Eleotris gundlachi* Poey.)

DORMITATOR MACULATUS (Bloch)

MAPO

Sciaena maculata BLOCH, *Ichthyologie, ou Histoire naturelle des poissons*, pl. 299, fig. 2, 1785 (West Indies) ref. copied).

The following collections were made by F. F. Bond:

26 specimens, 18 to 63 mm. in standard length, Río Cumboto, near Ocumare, January 5, 1938.

1 specimen, 14 mm., coastal lagoons, 15 km. north of Maracaibo, April 6, 1938.

9 specimens, 13 to 21 mm., Río Curiepe at Higuerote, February 2, 1939.

53 specimens, 13 to 26 mm., Río Guaiguaza, 3 km. west of Puerto Cabello, January 15, 1938.

2 specimens, 10.5 and 19 mm., Río Noguera at Noguera, January 13, 1938.

10 specimens, 12.5 to 30 mm., Río Borburata, 3 km. east of Puerto Cabello.

1 specimen, 15 mm., Río Cambur, tributary of Lago de Valencia, January 13, 1938.

Genus GOBIOMORUS Lacepède

Gobiomorus LACEPÈDE, *Histoire naturelle des poissons*, vol. 2, p. 583, 1800. (Genotype, *Gobiomorus dormitor* Lacepède.) (Ref. copied.)

Gobiomorus dormitor Lacépède

GUAVINA

Gobiomorus dormitor LACEPÈDE, Histoire naturelle des poissons, vol. 2, p. 583, 1800 (Martinique) (ref. copied).

The following collections were made by F. F. Bond. The specimens were identified by Isaac Ginsburg:

2 specimens, 69 to 71 mm., lagoon 3 km. west of Cumaná, March 26, 1939.

1 specimen, 50.5 mm., Río Borburata, 3 km. east of Puerto Cabello, January 15, 1939.

1 specimen, 18 mm., Caño Cambur, tributary of Lago de Valencia, 11 km. southeast of Valencia, January 13, 1938.

Genus ELEOTRIS Bloch and Schneider

Eleotris BLOCH AND SCHNEIDER, Systema ichthyologiae, p. 65, 1801. (Genotype, *Gobius pisonis* Gmelin.) (Ref. copied.)

ELEOTRIS AMBLYOPSIS (Cope)

GUAVINA

Culius amblyopsis COPE, Trans. Amer. Philos. Soc., vol. 14, p. 473, 1871 (Surinam) (ref. copied).

The following collections were made by F. F. Bond:

2 specimens, 19 and 30 mm. in standard length, Río Borburata, 3 km. east of Puerto Cabello, January 15, 1938.

1 specimen, 64.5 mm., Río Cerro Grande, 10 km. east of Macuto, December 22, 1937.

2 specimens, 47 and 49 mm., Río Cumboto, near mouth, 2 km. northwest of Ocumare, May 5, 1939.

6 specimens, 15 to 65 mm., Río Guaiguaza, 3 km. west of Puerto Cabello, January 15, 1938.

4 specimens, 29 to 59 mm., Río Sanchón, 5 km. west of Tavorda, January 26, 1938.

ELEOTRIS PISONIS (Gmelin)

GUAVINA

Gobius pisonis GMELIN, Systema naturae, p. 1206, 1789 (Río Almendares, Cuba) (ref. copied).

U.S.N.M. No. 123144, 2 specimens, Point Macolla, U.S.S. *Niagara*, April 19, 1925.

U.S.N.M. Nos. 123155 and 123156, 3 specimens, Macuto, Lyon and Robinson, August 2, 1900.

The following collections were made by F. F. Bond:

4 specimens, 26 to 80 mm. in standard length, Río Cumboto, near mouth, 2 km. northwest of Ocumare, May 5, 1939.

2 specimens, 63 and 76 mm., Río Guaiguaza, 3 km. west of Puerto Cabello, January 15, 1938.

1 specimen, 30 mm., Río Cumboto near Ocumare, January 5, 1938.

1 specimen, 49 mm., saline lagoon, El Cable at Carúpano, March 30, 1939.

7 specimens, 30 to 68 mm., Río Cerro Grande, 10 km. east of Macuto, December 22, 1937.

Family GOBIIDAE

Genus GARMANNIA Jordan and Evermann

Garmannia JORDAN and EVERMANN, Proc. California Acad. Sci., ser. 2, vol. 5, p. 497, 1895. (Genotype, *Garmannia paradoxa* [Günther]=*Gobius paradoxus* Günther.)

All the specimens of this genus that I collected were reported upon by Isaac Ginsburg (1944).

GARMANNIA SCHULTZI Ginsburg

Garmannia schultzi GINSBURG, Journ. Washington Acad. Sci., vol. 34, p. 375, 1944 (Lago de Maracaibo; 7 km. south of Maracaibo, Maracaibo Yacht Club; Salina Rica north of Maracaibo; Ciénaga del Guanavana north of Sinamaica).

U.S.N.M. No. 121546 and 121547 (holotype and paratypes) 34 specimens, from Lago de Maracaibo 7 km. south of Maracaibo, March 6, 1942.

U.S.N.M. No. 121548, 7 specimens, from Lago de Maracaibo opposite Salina Rica, February 20, 1942.

U.S.N.M. No. 121549 and 121550, 3 and 4 specimens, from Lago de Maracaibo at Yacht Club, March 5 and May 16, 1942, respectively.

U.S.N.M. No. 121552, 3 specimens, from Ciénaga del Guanavana, 12 km. north of Sinamaica, March 11, 1942.

GARMANNIA SPES Ginsburg

Garmannia spes GINSBURG, Journ. Washington Acad. Sci., vol. 29, p. 62, 1939 (Canal Zone, Panama); vol. 34, No. 11, p. 377, 1944 (caño west of Sinamaica, Venezuela).

A collection of 107 specimens, U.S.N.M. No. 121551, was made by Leonard P. Schultz on March 11, 1942, in a caño about $\frac{3}{4}$ km. west of Sinamaica.

Genus EVORTHODUS Gill

Evorthodus GILL, Proc. Acad. Nat. Sci. Philadelphia, vol. 11, p. 195, 1859. (Genotype, *Evorthodus breviceps* Gill=*Gobius lyricus* Girard.)

EVORTHODUS LYRICUS (Girard)

Gobius lyricus GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 10, p. 169, 1858 (Rio Brazos, Tex.).

U.S.N.M. No. 121545, 1 specimen, caño at Los Monitos, Río Limón system, March 11, 1942.

The following collections were made by F. F. Bond:

9 specimens, 35 to 76 mm., Río Borburata at mouth, 3 km. east of Puerto Cabello, at Gañanga, January 15, 1938.

5 specimens, 46 to 60 mm., Río Cumboto near Ocumare, January 6, 1938.

3 specimens, 21 to 89 mm., saline lagoon, El Cable at Carúpano, March 30, 1939.

29 specimens, 16 to 58 mm., Río Curiepe at Higuerote, February 2, 1939.

4 specimens, 44 to 52 mm., Río Guaiguaza, 3 km. west of Puerto Cabello, January 15, 1938.

6 specimens, 33 to 53 mm., Río Cerro Grande, 10 km. east of Macuto, December 22, 1937.

3 specimens, 48 to 57 mm., Laguna del Río Capatárida at mouth, 5 km. north of Capatárida, March 21, 1938.

15 specimens, 21 to 38 mm., Río Yaracuy at mouth, 45 km. northwest of Puerto Cabello, January 28, 1938.

2 specimens, 26 and 31 mm., Río Alpargatón, 5 km. north of Morón, January 28, 1938.

1 specimen, 77 mm., Río Cumboto near mouth, 2 km. northwest of Ocumare, May 5, 1939.

Genus BATHYGOBIUS Bleeker

Bathygobius BLEEKER, Arch. Néerl. Sci., Nat., vol. 13, p. 54, 1878. (Genotype, *Gobius nebulo-punctatus* Rüppell=*Gobius fastiatus* Rüppell.)

BATHYGOBIUS SOPORATOR (Cuvier and Valenciennes)

Gobius soporator CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 12, p. 56, 1837 (Martinique) (ref. copied).

U.S.N.M. No. 121543, 43 specimens, from Lago de Maracaibo at Maracaibo Yacht Club, May 16.

U.S.N.M. No. 121544, 2 specimens, from Lago de Maracaibo at Yacht Club, February 27.

Laguna de Tacarigua, Estado de Miranda, F. F. Bond, February 3, 1939, 1 specimen, 70 mm.

Saline lagoon, El Cable at Carúpano, F. F. Bond, March 30, 1939, 1 specimen, 50 mm.

Genus GOBIONELLUS Girard

Gobionellus GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 10, p. 168, 1858. (Genotype, *Gobionellus hastatus* Girard.)

GOBIONELLUS BOLEOSOMA (Jordan and Gilbert)

Gobius boleosoma JORDAN AND GILBERT, Proc. U. S. Nat. Mus., vol. 5, p. 295, 1882 (Laguna Grande, Pensacola, Fla.).

U.S.N.M. No. 123273, 1 specimen, 32 mm., Point Macolla, April 19, 1925.

2 specimens, 31 and 37 mm., Laguna de Tacarigua, Estado de Miranda, F. F. Bond, February 3, 1939.

4 specimens, 42 to 48 mm., Laguna del Río Capatárida, at mouth, 5 km. north of Capatárida, F. F. Bond, March 21, 1939, 4 specimens, 42 to 48 mm.

1 specimen, 39 mm., Río Borburata at mouth, 3 km. east of Puerto Cabello at Gañanga, F. F. Bond, January 15, 1938.

GOBIONELLUS CLAYTONII (Meek)

Gobius claytonii MEEK, Publ. Field Columbian Mus. (Zool.), vol. 3, p. 121, 1902 (La Antigua).

33 specimens, 28 to 86 mm., saline lagoon, El Cable at Carúpano, F. F. Bond, March 30, 1939.

1 specimen, 40 mm., Río Macarupano, 5 km. southeast of Carúpano, F. F. Bond.

1 specimen, 31 mm., coastal lagoon, 15 km. northeast of Maracaibo, F. F. Bond, April 6, 1938.

Genus AWAOUS Steindachner

Awaous STEINDACHNER, Sitzb. Akad. Wiss. Wien, vol. 42, p. 289, 1860. (Genotype, *Gobius ocellaris* Cuvier and Valenciennes.)

AWAOUS TAJASICA (Lichtenstein)

GUAVINA HORERA

Gobius tajasica LICHTENSTEIN, Abh. Akad. Wiss. Berlin, 1822, p. 273 (Brazil).

The following collections were made by F. F. Bond:

4 specimens, 25 to 206 mm., Río Cumboto, near Ocumare, January 5, 1938.

4 specimens, 60 to 121 mm., Río Agua Caliente, at Tavorda, 6 km. west of Puerto Cabello, January 15, 1938.

1 specimen, 171 mm., Río San Esteban at San Esteban near Puerto Cabello, December 25, 1937.

9 specimens, 30 to 68 mm., Río Cumboto near mouth, 2 km. northwest of Ocumare, May 5, 1939.

14 specimens, 18 to 70 mm., Río Guaiguaza, 3 km. west of Puerto Cabello, January 15, 1938.

1 specimen, 114 mm., a tributary of Río Manzanares, 12 km. northwest of Cumanacoa, March 26, 1939.

4 specimens, 23 to 92 mm., Río Sanchón, 5 km. west of Tavorda, January 26, 1938.

2 specimens, 19 to 39 mm., Río Borburata, at mouth, 3 km. east of Puerto Cabello at Gañanga, January 15, 1938.

1 specimen, 24 mm., Río Yaracuy, 8 km. southeast of San Felipe, January 27, 1938.

1 specimen, 16 mm., Río Curiepe at Higuerote, February 2, 1939.

Genus *SICYDIUM* Cuvier and Valenciennes

Sicydium CUVIER AND VALENCIENNES, Histoire naturelle des poissons, vol. 12, p. 168, 1837. (Genotype, *Gobius plumieri* Bloch.) (Ref. copied.)

SICYDIUM PUNCTATUM Perugia

SIRAJÓ

Sicydium punctatum PERUGIA, Ann. Mus. Civ. Storia Nat. Genova, ser. 2, vol. 16, p. 18, 1896 (Martinique) (ref. copied).

Sicydium montanum HUBBS, Proc. Biol. Soc. Washington, vol. 33, p. 89, 1920 (mountain brook at Macuto, Venezuela).

U.S.N.M. No. 122452, 1 specimen, Macuto, Lyon and Robinson, August 2, 1900.

The following collections were made by F. F. Bond:

1 specimen, 22 mm., Río Guataparo, tributary Río Paito to Río Paz, 8 miles west of Valencia, January 13, 1939.

1 specimen, 22 mm., lagoon 3 km. northwest of Petare, 15 km. east of Caracas, January 15, 1939.

1 specimen, 75 mm., saline lagoon, El Cable at Carúpano, March 30, 1939.

2 specimens, 43 and 46 mm., stream tributary to Río San Pedrito, 55 km. east of Barcelona, March 25, 1939.

21 specimens, 25 to 75 mm., Río Cerro Grande, 10 km. east of Macuto, December 22, 1937.

11 specimens, 23 to 58 mm., Río Cumboto near Ocumare, January 5, 1938.

5 specimens, 29 to 45 mm., Río Cumboto near mouth, 2 km. northwest of Ocumare, May 5, 1939.

SICYDIUM PLUMIERI (Bloch)**SIRAJÓ**

Gobius plumieri BLOCH, Ichthyologie, ou Histoire naturelle des poissons, p. 125, pl. 178, fig. 3, 1797 (Martinique) (ref. copied).

U.S.N.M. Nos. 93823 and 93824, 3 specimens, 77 to 83 and 94 mm., respectively, from Macuto, Lyon and Robinson, August 12, 1900.

U.S.N.M. No. 122454, 6 specimens, Macuto, Lyon and Robinson, August 2, 1900.

1 specimen, 39 mm., Río Cerro Grande, 10 km. east of Macuto, F. F. Bond, December 22, 1937.

17 specimens, 45 to 104 mm., Río Cumboto near Ocumare, F. F. Bond, January 5, 1938.

Order SCLEROPAREIOIDEA**Family SCORPAENIDAE: Scorpionfishes****Genus SCORPAENA Linnaeus**

Scorpaena LINNAEUS, Systema naturae, ed. 10, p. 266, 1758. (Genotype, *Scorpaena porcus* Linnaeus.)

SCORPAENA PLUMIERI Bloch**RASCACIO**

Scorpaena plumieri BLOCH, Vet.-Acad. Nya Handl., vol. 10, p. 234, 1789 (Martinique) (ref. copied).—GUNTER, Copeia, 1941, No. 2, p. 119 (Venezuela); 1942, No. 2, p. 106 (Venezuela).

U.S.N.M. No. 123197, 1 specimen, 47 mm. in standard length, from Cape San Román, U. S. S. *Niagara* April 2, 1925.

U.S.N.M. No. 123196, 1 specimen, 26 mm., from Jacuque Point, U. S. S. *Niagara*, January 26, 1925.

Family TRIGLIDAE: Gurnards; Sea-robins**Genus PRIONOTUS Lacepède**

Prionotus LACEPÈDE, Histoire naturelle des poissons, vol. 3, p. 336, 1802. (Genotype, *Trigla evolans* Linnaeus.) (Ref. copied.)

PRIONOTUS PUNCTATUS (Bloch)**RUBIO; VOLADOR; GALLINA DEL MAR**

Trigla punctata BLOCH, Naturgeschichte der ausländischen Fische, vol. 7, p. 125, pl. 353, 1793 (Martinique) (ref. copied).

Prionotus punctatus METZELAAR, Report on the fishes collected by Dr. J. Boeke in the Dutch West Indies in 1904-1905, p. 147, 1919 (Venezuela).—RÖHL, Fauna descriptiva de Venezuela, p. 411, 1942 (Venezuela).

U.S.N.M. No. 123168, 1 specimen, 209 mm. from Jacuque Point U. S. S. *Niagara*, January 26, 1925.

U.S.N.M. No. 123167, 2 specimens, 135 and 194 mm., from Piedras Bay, U. S. S. *Niagara*, March 14, 1925.

U.S.N.M. No. 123166, 1 specimen, 187 mm., from Estanques Bay, U. S. S. *Niagara*, December 7, 1924.

Order CEPHALACANTHOIDEA

Family DACTYLOPTERIDAE: Flying Gurnards

Genus DACTYLOPTERUS Lacepède

Dactylopterus LACEPÈDE, Histoire naturelle des poissons, vol. 3, p. 325, 1802.
(Genotype, *Dactylopterus pipapeda* Lacepède = *Trigla volitans* Linnaeus.)
(Genus selected by first reviser instead of *Cephalacanthus* Lacepède, *ibid.*, p. 323.)

DACTYLOPTERUS VOLITANS (Linnaeus)

VOLADOR

Trigla volitans LINNAEUS, Systema naturae, ed. 10, vol. 1, p. 302, 1758.
Cephalacanthus volitans RÖHL, Fauna descriptiva de Venezuela, p. 411, fig. 228, 1942 (Venezuela).

Order PLEURONECTOIDEA

Suborder PSETTODIDEA

Family BOTHIDAE: Soles

A key to the species of the flatfish family Bothidae is given by J. R. Norman in a systematic work, "Monograph of the Flatfishes (Heterosomata)," vol. 1, pp. 60-61, 1934, published by the British Museum. Not enough species have been recorded from Venezuela to make it worth while to construct a key in this report. Several other species of flatfishes will undoubtedly be taken when adequate collecting is done along the Venezuelan coast.

Genus CITHARICHTHYS Bleeker

Citharichthys BLEEKER, Versl. Akad. Amsterdam, vol. 13, p. 423, 1862. (Genotype, *C. cayennensis* Bleeker.)

CITHARICHTHYS SPILOPTERUS Günther

Citharichthys spilopterus GÜNTHER (part), Catalogue of the fishes in the British Museum, vol. 4, p. 421, 1862 (New Orleans; Jamaica; San Domingo; Bahia).

U. S. N. M. No. 121812, 1 specimen, 47 mm., Lago de Maracaibo at Maracaibo Yacht Club, May 16, 1942.

U.S.N.M. No. 121813, 6 specimens, 30 to 66 mm., Lago de Maracaibo at Maracaibo Yacht Club, March 5, 1942.

U.S.N.M. No. 121814, 2 specimens, 22 and 40 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, March 12, 1942.

1 specimen, 84 mm., Laguna del Río Capatárída at mouth, 5 km. north of Capatárída, F. F. Bond, March 21, 1938.

1 specimen, 101 mm., saline lagoon, El Cable at Carúpano, F. F. Bond, March 30, 1939.

3 specimens, 45 to 77 mm., Laguna de Tacarigua, Estado de Miranda, F. F. Bond, February 3, 1939.

The following counts were made on the above-listed specimens: Dorsal rays, four counts for 78, one for 79, two for 80, one of 83; anal rays, one count each for 56, 58, 59, two counts each for 60 and 61, one for 62.

Genus *ETROPUS* Jordan and Gilbert

Etropus JORDAN AND GILBERT, Proc. U. S. Nat. Mus., vol. 4, p. 364, 1882. (Genotype, *Etropus crossotus* Jordan and Gilbert.)

ETROPUS LONGIMANUS Norman

Etropus longimanus NORMAN, Ann. Mag. Nat. Hist., ser. 10, vol. 12, p. 202, 1933 (C. Frio, Brazil).

The following small specimen is identified as this species with uncertainty:

U.S.N.M. No. 123142, 1 specimen, 36 mm., south coast of Gulf of Venezuela, U. S. S. *Niagara*, November 15, 1924.

ETROPUS DELSMANI Chabanaud

Etropus delsmanni CHABANAUD, Bull. Mus. Nat. Hist. Nat., ser. 2, vol. 12, p. 149, 1940 (Isla de Santa Margarita).

Suborder SOLEIFORMES

Family ACHIRIDAE: Tonguefishes; Soles; Lenguados

KEY TO THE GENERA AND SPECIES REPORTED FROM VENEZUELA

- 1a. Interbranchial septum between the right and left gill chambers perforated by a roundish opening (fenestra) posteriodorsally.
- 2a. Gill membranes fused with the hyoid, internally and above the pelvic arch, anteroventrally to the fenestra; nasal spine not projecting through the skin in front of tubular nostril; posterior dorsal side of gill opening on blind side with a double membranous flap of skin fringed with cirri along both edges; pectoral fin of one to four short rays; a deep pit on blind side above upper jaw a short distance in front of tubular nostril.
 - Hypoclinemus mentalis* (Günther)
- 2b. Gill membranes not fused to the hyoid-pelvic region, entirely free ventrally; nasal spine projecting through the skin, in front of tubular nostril; posterior dorsal edge of gill opening on blind side with a single fringed membranous flap of skin; pectoral fin well developed, of about 5 rays; no deep pit on blind side above maxillaries and a short distance in front of tubular nostril.-----*Achirus achirus maculipinnis* (Agassiz)
- 1b. Interbranchial septum not perforated; gill membranes free from hyoid region; nasal spine not projecting through the skin in front of tubular nostril; posterior dorsal side of gill opening on blind side with a single free fringed dermal membrane; pectoral fin absent or with one short ray; practically no depression or pit above maxillary and in front of tubular nostril on blind side.-----*Trinectes maculatus brownii* (Günther)

Genus *HYPOCLINEMUS* Chabanaud

Hypoclinemus CHABANAUD, Bull. Inst. Oceanogr., No. 523, p. 32, 1928. (Genotype, *Solea mentalis* Günther, fixed by Myers, Copeia, No. 171, p. 37, 1929.)

HYPOCLINEMUS MENTALIS (Günther)

Solea mentalis GÜNTHER, Catalogue of the fishes in the British Museum, vol. 4, p. 475, 1862 (Rio Capim, Pará).

The following collection was made by Dr. F. F. Bond.

Six specimens, 47.5 to 123 mm., from Río Apure at San Fernando de Apure, November 11, 1938.

These specimens have the following number of fin rays: Dorsal, 53 in two and one count each for 56, 57, 58 and 59; anal, one count each for 41, 42, 43, two for 44, and one for 45; pectoral, one count each for 2 and 4 and four for 3; pelvics, two counts for 4 and ten for 5 rays.

Genus ACHIRUS Lacepède

Achirus LACEPÈDE, Histoire naturelle des poissons, vol. 4, p. 658, 1802. (Genotype, *Pleuronectes achirus* Linnaeus.)

ACHIRUS ACHIRUS MACULIPENNIS (Agassiz)

SOLE; CARNADA DE SAN PEDRO; LENGUADO O SOL

Monochir maculipennis AGASSIZ, in Spix and Agassiz, Selecta genera et species piscium . . . Brasiliam . . ., p. 88, pl. 49, pl. D, 1831 (Atlantic Ocean, Brazil).

? *Achirus lineatus* RÖHL, Fauna descriptiva de Venezuela, p. 390, fig. 199, 1942 (coast of Venezuela).

One specimen, 375 mm. in standard length, from Laguna de Tacarigua, Estado de Miranda, F. F. Bond, February 3, 1939.

U.S.N.M. No. 121815, a specimen, 48 mm. in standard length, from Lago de Maracaibo at Maracaibo Yacht Club, Maracaibo, March 5, 1942.

The above-listed specimens have dorsal rays 54 and 54; anal rays 43 and 41; the pelvics 5-5 and 5-5; median fins with roundish dark brown spots.

Genus TRINETES Rafinesque

Trinetes RAFINESQUE, Atlantic journal and friend of knowledge, vol. 1, p. 20, 1832. (Genotype, *Trinetes scabra* Rafinesque=*Achirus fasciatus* Lacepède.) (Ref. copied.)

TRINETES MACULATUS BROWNII (Günther)

LENGUADO

Solea brownii GÜNTHER, Catalogue of the fishes in the British Museum, vol. 4, p. 477, 1862 (New Orleans; Texas).

The following collections I am referring to this subspecies mostly on the basis of Chabanaud's work (Bull. Inst. Oceanogr., No. 661, pp. 1-24, figs. 1-11, 1935).

U.S.N.M. No. 121810, 7 specimens, 18 to 94 mm., from Lago de Maracaibo at Maracaibo Yacht Club, May 16, 1942.

U.S.N.M. No. 121811, a specimen, 79 mm., Lago de Maracaibo, 7 km. south of Maracaibo, March 6, 1942.

2 specimens, 25 and 29 mm., from salt-water lagoon on coast, 5 km. west of Cumaná, F. F. Bond, March 25, 1939.

1 specimen, 26.5 mm., from Laguna del Río Capatárida at mouth, 5 km. north of Capatárida, Estado de Falcón, F. F. Bond, March 21, 1938.

1 specimen, 15 mm., from Río Marguanta, tributary to Río Orinoco, F. F. Bond, March 10, 1939.

7 specimens, 26 to 43 mm., from Laguna de Tacarigua, Estado de Miranda, F. F. Bond, February 3, 1939.

Order DISCOCEPHALIOIDEA

Family ECHENEIDAE: Sharkpilots; Remoras

Genus ECHENEIS Linnaeus

Echeneis LINNAEUS, after Artedi, *Systema naturae*, ed. 10, p. 260, 1758. (Genotype, *Echeneis neucrates* Linnaeus.)

ECHENEIS NEUCRATES Linnaeus

RÉMORA O PEGA

Echeneis neucrates LINNAEUS, *Systema naturae*, ed. 10, p. 261, 1758.—RÖHL, *Fauna descriptiva de Venezuela*, p. 410, fig. 227, 1942 (coast of Venezuela).

U.S.N.M. No. 128264, 1 specimen, 159 mm. in standard length, from Piedras Bay, Gulf of Venezuela, March 14, 1925, U. S. S. *Niagara*.

Order PLECTOGNATHOIDEA

Suborder BALISTOIDEA

Family BALISTIDAE: Triggerfishes

Genus BALISTES Linnaeus

Balistes LINNAEUS, *Systema naturae*, ed. 10, vol. 1, p. 327, 1758. (Genotype, *Balistes vetula* Linnaeus.)

BALISTES VETULA Linnaeus

CACHÚA O COCHINO

Balistes vetula LINNAEUS, *Systema naturae*, ed. 10, vol. 1, p. 329, 1758 (Ascension Island).—RÖHL, *Fauna descriptiva de Venezuela*, p. 409, fig. 226, 1942 (coast of Venezuela).

Suborder OSTRACIOIDEA

Family OSTRACIIDAE: Trunkfishes; Cofres

Genus LACTOPHRYS Swainson

Lactophrys SWAINSON, *Natural history and classification of fishes*, vol. 2, pp. 194, 324, 1839. (Genotype, *Lactophrys trigonus* (Linnaeus).)

KEY TO THE SPECIES REPORTED FROM VENEZUELA

- 1a. Bony covering or carapace without spines anywhere; body with numerous pale spots dorsally.....*Lactophrys triqueter* (Linnaeus)
- 1b. Carapace with a spine in front of each eye, another posteriorly on each ventral ridge, and one above and below at front of caudal peduncle; color brownish with blackish spots except on ventral surfaces.

Lactophrys tricornis (Linnaeus)

LACTOPHRYS TRIQUETER (Linnaeus)

CHAPIN O SAPO DE MAR

Ostracion triquet LINNAEUS, *Systema naturae*, ed. 10, vol. 1, p. 330, 1758 ("India").

Lactophrys triquet RÖHL, *Fauna descriptiva de Venezuela*, p. 385, figs. 192, 193, 1942 (coast of Venezuela).

LACTOPHRYS TRICORNIS (Linnaeus)

TORO O VAQUITO

Ostracion tricornis LINNAEUS, *Systema naturae*, ed. 10, vol. 1, p. 331, 1758. ("India").

Lactophrys tricornis RÖHL, *Fauna descriptiva de Venezuela*, p. 386, fig. 194, 1942 (coast of Venezuela).

Suborder TETRAODONTOIDEA

Family TETRAODONTIDAE: Puffers; Tamboriles

KEY TO GENERA OF TETRAODONTIDAE REPORTED FROM VENEZUELA

1a. Dorsal rays 8, anal 7, counting rudiments; 2 distinct openings on each more-or-less tubular nostril; inner surface of nasal tube with one or more folds; lower sides of body without a dermal fold along a lateral line tube.

Sphoeroides Anonymous

1b. Dorsal rays 10 to 15; anal 9 to 13.

2a. Dorsal rays about 10, anal rays 9 to 10; no dermal fold along lower sides of body; gill opening extends down in front of about 7 pectoral rays; caudal fin truncate or a little concave.

3a. Nostrils without a distinct tube or tentacle but with a small porelike opening on each side; back in front of dorsal fin compressed into a low keellike ridge or short prominence; margin of eye without eyelid; snout somewhat pointed.....**Canthigaster** Swainson

3b. Nostrils with 2 distinct openings on each side at tip of a short tube; back without keel, more or less depressed; membrane of eye free ventrally for a short distance, but fused dorsally; snout blunt, rounded.

Colomesus Gill

2b. Dorsal rays about 13 to 15; anal rays 12 or 13; lower sides with a dermal fold along a lateral line tube; tubular nostrils with 2 small openings distally; back without ridge, more or less depressed; membrane of eye free ventrally, fused dorsally; gill opening extending down in front of about 8 to 10 pectoral rays; caudal fin forked.**Lagocephalus** Swainson

Genus SPHOEROIDES Anonymous

Sphoeroides (Author anonymous), *Allg. Lit.-Zeit.*, column 676, 1798. (Cenotype, *Tetrodon spengleri* Bloch.) (Ref. copied.)

The correct identification of the puffers in the western Atlantic referred to the genus *Sphoeroides* is very difficult if not impossible for certain forms. There appears to be so much variation in size of eye and head and in other morphological characters that most keys lead to doubtful identifications. Since no revision of this genus has been

made and sufficient material of the various forms described are lacking for study, the following tentative key must be used with caution for the area adjacent to the coast of Venezuela and northward. A species difficult to place is *Sphoeroides harperi* Nichols (Bull. Amer. Mus. Nat. Hist., vol. 33, art. 3, p. 81, 1914) from Cape Sable, Fla. This species may be *maculatus*.

Meek and Hildebrand ("The Marine Fishes of Panama", part 3, p. 813, pl. 77, 1928) use the name *Sphoeroides marmoratus* (Ranzani) for a species covered with minute imbricated scales that lacks the line of black spots set off below the dark coloration of upper sides. However, *Tetraodon marmoratus* Ranzani (Dissertationes Quat. Novi Comm. Acad. Sci. Inst. Bonon., vol. 4, p. 73, pl. 10, figs. 1a, 1b, 1840) as represented by the figures is definitely not the same species as the one illustrated on plate 77 of Meek and Hildebrand. I see no reason at present why *T. marmoratus* Ranzani cannot be considered a synonym of *Sphoeroides spengleri* as currently recognized. Specimens of *spengleri* from Brazil appear to be the same as those from Panama and the West Indies.

Sphoeroides marmoratus Meek and Hildebrand (not of Ranzani) I refer to *Sphoeroides eulepidotus* (Metzelaar), basing my opinion on several small series in the national collections.

The color patterns of *maculatus* and *nephelus* and the imbricate scales indicate that *eulepidotus* is very closely related and possibly not distinct from *nephelus*. I do not find any specimens of the typical color pattern of *maculatus* south of the Carolinas in the national collections.

KEY TO CERTAIN SPECIES OF SPHOEROIDES

- 1a. Lower sides with a line of dark bars or roundish spots a little below and well set off from darker ground color of upper sides and back, these bars or spots numbering 5 in front of the pectoral base and 7 or 8 behind it, totaling 12 or 13.
- 2a. Dark spots in a line roundish to oval in shape and black spot at lower rear base of pectoral not quite reaching to middle of pectoral fin base and little or no darker than others in line; a black bar across caudal fin distally and another basally, separated by a pale bar; back variably light spotted and dark spotted; least distance between bases of nasal tubes about 5 to 7 times in the snout; postorbital length of head 1.5 to 2 times in snout; dermal papillae often present on sides; body often with prickles in front of dorsal and anal fins; distal margins of dorsal and anal fins rounded; dermal cirri often occurring on the sides of young specimens.-----*Sphoeroides spengleri* (Bloch)
- 2b. Line of dark bars vertically elongate and extending up into dark ground color of sides; black spot or bar in axil of pectoral much darker than any of others in the line and usually reaching up to or above midpectoral base; no blackish or pale bars across caudal fin; back usually dark spotted; least distance between bases of nasal tubes about 3.5 to 5 times in snout; postorbital length of head 1.25 to 1½ in snout; anterior

parts of body in front of dorsal and anal fins profusely prickly, and scales somewhat imbricated occurring all over body in young, but in adults the body smoother, especially caudal region.

Sphoeroides maculatus²⁷ (Bloch and Schneider)

- 2c. Line of dark bars vertically elongate but hourglass-shaped behind pectoral; black spot in axil of pectoral intensified but not reaching above middle of base of pectoral; upper part of body brownish and overlaid with numerous very small circular-shaped white blotches everywhere; caudal fin plain pale in color; least distance between bases of nasal tubes about 4.5 to 5 times in snout; postorbital length of head 1.5 to 1½ in snout; body prickly anteriorly and covered with small imbricated scales; prickles usually with 4-pointed bases; distal margin of dorsal fin truncate, that of anal rounded.....**Sphoeroides nephelus**²⁸ (Goode and Bean)

- 1b. Line of dark bars or spots absent, or, if present, not separated from dark ground color of sides and back.

- 3a. Back darkish (often greenish when alive) with pale lines forming a coarsely reticulated pattern and the sides have small dark spots, more numerous with age, but fading ventrally so that the belly is white as usual; caudal fin more or less darkish with a pale bar across the fin a little closer to its base than distally; scales not noticeably developed although anteriorly the body is prickly; least distance between nostrils 2.75 to 3 times in snout; postorbital length of head 1.2 in snout; distal margin of dorsal truncate or slightly rounded.....**Sphoeroides testudineus** (Linnaeus)

- 3b. No pale lines forming a reticulated color pattern on back.

- 4a. Color plain brownish above and largely on sides, with a single large blackish spot, somewhat vertically elongate, on middle of sides a little in advance of dorsal origin; sometimes a pair of dermal cirri on middle of back; brownish color of back with small pale specks or spots; body not covered with small imbricated scales although small glandular-like scales occurring irregularly on body; body prickly anteriorly; caudal fin with a dark bar distally and one basally separated by a pale bar; least distance between bases of nasal tubes about 5 to 6.25 times in snout; postorbital length of head about 1.75 to 2 times in snout; distal margin of dorsal fin truncate; that of anal truncate or a trifle rounded; outer rays of caudal fin a little longer than others, so that distal margin of this fin is slightly concave.

Sphoeroides dorsalis²⁸ (Longley)

- 4b. Body everywhere, except ventrally, with brown spots, these spots not in rows, their number apparently increasing with age; caudal fin usually, except in larger specimens, with a pale bar across middle separating more or less distinct darker bars distally and basally; body everywhere covered with numerous very small imbricated scales; least distance between bases of nasal tubes contained 4.5 to 6 times in snout; postorbital length of head 1.25 to 1½ in snout; dorsal slightly rounded to truncate distally, anal fin rounded; dermal cirri usually present on sides.....**Sphoeroides eulepidotus** (Metzelaar)

SPHOEROIDES SPENGLERI (Bloch)

Tetrodon spengleri BLOCH, Ichthyologic, ou Histoire naturelle des poissons, vol. 4, p. 134, pl. 144, 1797.

²⁷ Not reported from Venezuela and probably not occurring south of Florida.

²⁸ Not reported from Venezuela but occurring off Florida and in West Indies.

This species has a distribution from Florida and Gulf of Mexico through the West Indies to Brazil and most certainly will be taken off Venezuela, although so far I fail to find any record of its capture from that country.

SPHOEROIDES TESTUDINEUS (Linnaeus)

YEQUE O SAPO BRUTO

Tetraodon testudineus LINNAEUS, Systema naturae, ed. 10, p. 332, 1758.

Sphoeroides testudineus RÖHL, Fauna descriptiva de Venezuela, p. 387, fig. 195, 1942 (coast of Venezuela).

U.S.N.M. No. 121700, 36 specimens, 22 to 118 mm. in standard length, Lago de Maracaibo at Yacht Club, Maracaibo, May 16, 1942.

U.S.N.M. No. 121701, 22 specimens, 20 to 61 mm., Lago de Maracaibo opposite Salina Rica, 5 km. north of Maracaibo, February 20, 1942.

U.S.N.M. No. 121699, 94 specimens, 18 to 94 mm., Lago de Maracaibo at Yacht Club, Maracaibo, February 27 and March 5, 1942.

U.S.N.M. No. 121698, 17 specimens, 21 to 101 mm., mouth of Caño de Sagua, 25 km. north of Sinamaica, March 21, 1942.

U.S.N.M. No. 121697, 78 specimens, 17 to 122 mm., Lago de Maracaibo, 7 km. south of Maracaibo, March 6, 1942.

Two specimens, 60 and 93 mm., a baja seca, east side of Puerto Cabello, F. F. Bond, January 26, 1938.

SPHOEROIDES EULEPIDOTUS (Metzelaar)

Tetrodon (Spherooides) eulepidotus METZELAAR, Rapport Onderz. Toest. Viss. Ind. Zeeprod. Kol. Curaçao, vol. 2, p. 170, fig. 54, 1919 (Lesser Antilles).

Specimens before me from the collection in the United States National Museum indicate that this species ranges from Texas, Panama, and West Indies to Rio de Janeiro, Brazil.

U.S.N.M. No. 122001, 4 specimens, 22 to 5 mm., in standard length, Cape San Román, U. S. S. *Niagara*, April 2, 1925.

U.S.N.M. No. 122002, 1 specimen, 13 mm., south coast of Gulf of Venezuela, U. S. S. *Niagara*, November 15, 1925.

U.S.N.M. No. 121702, 1 specimen, 29.5 mm., from a brackish caño at Los Monitos, Río Limón system, Leonard P. Schultz, March 11, 1942.

Genus CANTHIGASTER Swainson

Canthigaster SWAINSON, The natural history and classification of fishes, vol. 2, p. 194, 1839. (Genotype, *Tetrodon rostratus* Bloch.)

CANTHIGASTER ROSTRATUS (Bloch)

Tetrodon rostratus BLOCH, Ichthyologie, ou Histoire naturelle des poissons, vol. 5, p. 4, pl. 146, fig. 2, 1787 ("Indes orientales").

Tetrodon (Canthigaster) rostratus METZELAAR, Rappt. Onderz. Toest. Viss. Ind. Zeeprod. Kol. Curaçao, vol. 2, p. 171, 1919 (Venezuela).

Genus COLOMESUS Gill

Colomesus GILL, Proc. U. S. Nat. Mus., vol. 7, p. 422, 1884. (Genotype, *Tetrodon psittacus* Bloch and Schneider.)

COLOMESUS PSITTACUS (Bloch and Schneider)

Tetrodon psittacus BLOCH AND SCHNEIDER, Systema ichthyologiae, p. 505, 1801 (Malabar).

Colomesus psittacus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 437 (Tucapita on Río Manamo; Pedernales, Venezuela).

Genus LAGOCEPHALUS Swainson

Lagocephalus SWAINSON, The natural history and classification of fishes, vol. 2, pp. 194, 328, 1839. (Genotype, *Lagocephalus stellatus* Donovan.)

LAGOCEPHALUS LAEVIGATUS (Linnaeus)

Tetraodon lagocephalus LINNAEUS, Systema naturae, ed. 10, vol. 1, p. 332, 1758 ("India").

Tetraodon (Lagocephalus) pachycephalus METZELAAR, Rappt. Onderz. toest. Viss. Ind. Zeeprod. kol. Curaçao, vol. 2, p. 169, 1919 (Cumana, Venezuela).

U.S.N.M. No. 122000, 1 specimen, 230 mm. in standard length, Estanques Bay, U. S. S. Niagara, December 9, 1924.

U.S.N.M. No. 122003, 1 specimen, 42 mm., Jacuque Point, U. S. S. Niagara, January 26, 1925.

Our series of *Lagocephalus laevigatus* before me indicates that *Tetraodon pachycephalus* Ranzani is a synonym and that the depth and head length vary considerably with increase in size.

Suborder DIODONTOIDEA

Family DIODONTIDAE: Porcupinefishes

Genus DIODON Linnaeus

Diodon LINNAEUS, Systema naturae, ed. 10, vol. 1, p. 334, 1758. (Genotype, *Diodon hystrix* Linnaeus.)

Two species of *Diodon*—*hystrix* and *holacanthus*—are currently recognized, but after examining a rather large series of both as indentified by several ichthyologists in the past, I find so much overlapping in the two forms that I must cast serious doubt on their distinctness. I notice that specimens up to 50 to 200 mm. in standard length have relatively longer frontal spines than postpectoral spines, some dermal cirri along lower sides of body and usually a pair under the chin. On all the large specimens of *Diodon*, however, I fail to locate these dermal cirri, and the frontal spines appear to be shorter than the postpectoral ones, but this is caused by more of the base of the frontal spines being embedded in the skin. The genus is in need of revision. Provisionally I am combining *hystrix* and *holacanthus* because I am unable to separate the two species as based on the material before me from the Atlantic and Pacific Oceans.

DIODON HYSTRIX Linnaeus

ERIZO O PUERCO ESPÍN

Diodon hystrix LINNAEUS, Systema naturae, ed. 10, vol. 1, p. 335, 1758 (India).—RÖHL, Fauna descriptiva de Venezuela, p. 388, fig. 196, 1942 (coast of Venezuela).

U.S.N.M. No. 122004, a specimen 100 mm. in standard length, Gulf of Venezuela, U. S. S. *Niagara*, 1925.

The following counts were made: Dorsal rays 14 in 3 and 15 in 1 specimens; anal 13 rays in 2, and 14 in 3 specimens; pectoral rays 21 in one specimen, 22 in 6 counts, and 23 in 3.

Order GOBIESOCIFORMES

Family GOBIESOCIDAE: Clingfishes; Trepadores

During my attempt to identify the Venezuelan specimens of clingfishes in the national collections, it became clear to me that the American Gobiesocidae were in a state of confusion and were in need of revision. This was necessary before I could determine the genus or species to which the Venezuelan clingfishes belonged. After 3 months of work, a manuscript was prepared and published (Schultz, 1944e). The following key was modified from that publication so as to key out all American genera, and it includes only those species that have been reported from Venezuela:

1a. Groove between tip of snout and upper lip of premaxillaries extending around front of snout and not forming a convex curve dorsally over tip of snout; width of middle of upper lip narrow, about the same as laterally, and approximately equal to width of pupil; gill membranes attached opposite third and fifth upper pectoral fin rays; axial flap of skin behind pectoral fin with its upper edge attached at midbase of pectoral fin or below midbase; fleshy pad on outer pectoral base present only ventrally, without a free margin posteriorly and enlarged or swollen at lower posterior corner of pectoral fin base; the lower first to fifth pectoral rays short, about half length of longest pectoral ray, the eighth and ninth much longer than lower pectoral rays; anal rays 6 or 8; dorsal rays 6 or 7 (all rudiments counted as one ray).

2a. Incisorlike teeth at front of lower jaw with 4 minute points²⁹; those at front of upper jaw mostly conical; each jaw with 1 or 2 inner rows of minute conical teeth; axial flap of skin behind pectoral fin attached at lower part of pectoral fin base; anal origin a little behind a vertical line through dorsal origin; greatest depth of body 5.5 to 6.5, length of head 3 to 3.25, greatest width of head 4.5 to 5, length of disk 5 to 5.5, all in standard length; length of disk about equal to distance from tip of snout to front of disk; pectoral rays about 19 to 21; color when alive green or reddish, with or without light spots (Florida Keys and West Indies).

Acyrtus Schultz³⁰

2b. Incisorlike teeth at front of lower jaw with smooth tips; middle front teeth of upper jaw conical; teeth in inner rows of both jaws shorter, smaller, and conical; axial flap of skin behind pectoral fin attached opposite middle of pectoral base; greatest depth of body 8 or 9, length of head 3.5 to 3.8, greatest width of head 5, length of disk 5.5, all in standard length; anal origin a little in advance of dorsal origin; interorbital space 3.5 in head, eye 1.5 in interorbital space; length of disk about equal to

²⁹ Sometimes the middle two teeth are worn down nearly smooth, as in the type of *G. beryllinus* Hildebrand and Ginsburg.

³⁰ Not yet reported from Venezuela.

caudal peduncle; lower pectoral rays shorter, second and third from bottom about half length of longest pectoral fin rays; pectoral fin rays about 16 or 17 (Todos Santos Bay, Baja California, to Monterey, Bay and west coast of Vancouver Island, British Columbia).

Rimicola Jordan and Evermann

- 1b. Tip of snout formed by premaxillaries, which are much wider at middle of snout than laterally, groove arched dorsally over tip of snout; axial flap of skin behind pectoral fin with its upper edge attached much above the midbase of this fin; lower first to seventh pectoral fin rays not shortened, about as long as eighth or ninth from bottom.
- 3a. Anterior teeth of lower jaw trifid incisors, trifid tips usually evident, except the middle 2 or 3 may be worn off smooth although 1 or 2 of more laterally placed incisors at front of lower jaw are always trifid.
- 4a. Gill membrane attached opposite third to fifth pectoral fin rays; front teeth of upper jaw smooth-tipped incisors (sometimes flattened-coniform); front of both jaws with 1 or 2 inner rows of small conical teeth behind outer row of enlarged incisorlike teeth, sometimes these inner rows apparently represented by only 2 or 3 teeth; fleshy pad on outer base of pectoral fin with free posterior margin ending a little below attachment of gill membranes; greatest width of head 3, length of head 2.75 to 2.8, greatest depth of body 5 to 6, length of disk 3.5, all in standard length; length of disk much greater than distance from tip of snout to front of disk; distance from dorsal origin to midbase of caudal fin contained 1.75 to 1.8 times in snout tip to dorsal origin; anal origin under base of the third or fourth dorsal fin ray; caudal peduncle short, its depth about equal to its length and about 3 times in base of dorsal fin; dorsal fin rays 11 to 13, anal 10 or 11, pectoral 18 or 21 (usually 19 or 20) (Gulf of California; southern California).

Infratridens Schultz

- 4b. Gill membranes joined opposite upper edge of pectoral fin base; incisorlike teeth of both jaws with trifid tips except middle pair or two sometimes smooth tipped; teeth in both jaws in a single row, lateral 2 to 4 conical and last 1 or 2 sometimes strong canines; outer lower base of pectoral fin with fleshy pad poorly developed and without any trace of free margin; pelvic fins joined about halfway out fourth to sixth pectoral fin rays and not near base; dermal flap in axil of pectoral fin joins opposite the fourth to tenth pectoral fin ray; width of head 3.5 to 6, length of head $2\frac{2}{3}$ to 5, greatest depth of body usually 6 to 10, length of disk usually 4 to 6, all in standard length; opercular spine not strongly developed and not reaching to rear of head.

Arbaciosa Jordan and Evermann

- 5a. A pair of black spots (more or less ocellate) on back behind head over pectorals usually distinct, each spot well separated; dorsal surface of back in front of dorsal origin variously barred or mottled or dark spotted but without 3 hourglass-shaped large dark blotches. (Species inhabiting waters of Pacific coast and offshore islands.)
- 5b. Three or four large hourglass-shaped dark brown or blackish blotches from in front of dorsal fin to rear of head; a fainter one sometimes on top of head; side of head with 4 oblique bars and sides of body with dark bars; incisors with trifid tips; dorsal rays 7 to 9; and 6 to 9 (rarely 6 or 9); pectorals 18 to 23 (West Indies; Guatemala to Brazil).

Arbaciosa fasciata (Peters)

- 3b. None of teeth with trifid tips.

- 6a. Middle pair of incisors on both jaws much broader and longer than adjoining pairs; posterolateral teeth small and conical; rims of orbits bony, elevated; opercular spine strongly developed and forming posteriormost tip of head; valvular flap and margin of anterior nostril with its margin finely fringed with short cirri; gill membrane attached at upper anterior edge of pectoral fin base; fleshy pad well developed on outer lower surface of pectoral base, with a free membranous edge posteriorly ending at base of tenth to twelfth pectoral ray; shoulder girdle with a free dermal flap extending dorsally nearly to attachment of gill membrane; anal origin under base of second or third from last dorsal fin ray; disk large, its length about equal to head and contained about 2.4 to 2.8 in standard length; anus just behind rear margin of disk; origin of dorsal fin a trifle closer to tip of opercular spine than midcaudal fin base; dorsal rays 10 or 11 (usually 11); anal 8 or 9; pectoral 24 or 25 (Chile and Peru; Juan Fernández Islands).

Sicyases (Müller and Troschel)

- 6b. Middle pair of incisors not enlarged, all incisorlike or conical teeth at front of both jaws of nearly same size and length; front of lower jaw with small incisors in 2 or 3 pairs, with smooth tips; posterolateral teeth smaller, conical, sometimes one or two a little enlarged and almost canineline; usually a small patch of very short conical teeth behind outer row of larger teeth at front of jaws but sometimes lacking or reduced to 1 or 2 teeth; rims of orbits not elevated or bony; anterior nostril with a dermal flap, sometimes with bifid or even multifid tips arising on posterior rim, but nostrils not fringed with short cirri.
- 7a. Short blunt papillae on lips and around mouth generally, these in form of short barblets, arrangement as follows: Median part of chin and lower jaw with 2 or 3 rows of papillae, or chin anteriorly with a pair of low lobes in form of reversed parentheses () and sometimes at their inner tips a pair of papillae (more or less fused with the anterior lobes in *nigripinnis* and in *pinniger*); an inner row of barblets lateral to median lobes, one pair on each side; lower lip at each side of median part of chin lobelike, sometimes bearing 2 small papillae; 2 or 3 large papillae or knobs on each side along inner edge of groove of lower jaw; upper lip with a median papilla or knob and 5 more on each side; front edge of snout above groove without papillae but laterally 3 to 5 knobs or papillae present or absent; sometimes another papilla occurring behind rictus and still another below rictus; gill membranes joined opposite fifth to seventh upper rays of pectoral fin; fleshy pad on outer base of pectoral fin with a free posterior membranous margin extending dorsally to opposite attachment of gill membranes; dorsal rays 10 to 19; pectoral fin rays 21 to 27; anus closer to anal origin than to rear margin of disk. (Maryland to West Indies to Brazil in Atlantic; Gulf of California to Peru and Cocos Island, in Pacific, *Cotylin* Müller and Troschel.) Depth 4.5 to 6.5, eye 3.1 to 3.6 in length of base of dorsal fin; dorsal rays usually 11, anal usually 9, pectoral rays 22 to 26 (Maryland to West Indies to Brazil).

Cotylin nigripinnis nigripinnis (Peters)

- 7b. No papilla on upper lip, lobelike structures occurring around lips of the lower jaw when best developed being low knobs or ridges, chin lacking inner series of papillae as described for *Cotylin*.
- 8a. Gill membranes joined at upper edge of pectoral fin base, sometimes a little anteriorly, giving appearance of being opposite bases of upper first to third pectoral fin rays or the orbits larger than inter-

orbital space; incisorlike teeth at front of lower jaw projecting forward in a nearly horizontal or oblique direction, usually middle pair a little larger than those laterally.

- 9a. Anal rays 10 to 14; dorsal rays 12 to 16, pectoral rays 19 to 23 (counting all rudiments); fleshy pad on outer margin of pectoral fin base very well developed and free membranous border along its posterior edge extending up to or beyond twelfth pectoral ray from the dorsal edge; interorbital space equal to or wider than eye; least depth of caudal peduncle 4.5 to 5.25 times in dorsal origin to midcaudal fin base; anal origin under anterior third of dorsal fin base (Peru and Chile; San Diego to Queen Charlotte Island, Puget Sound) ----- *Sicyogaster* Brisout de Barneville
- 9b. Anal rays 7 or 8; dorsal 7 to 9; pectorals 22 to 25; diameter of eyes greater than interorbital space except in large adults equal; interorbital space about three-fifths to three-fourths in eye, color usually reddish when alive (Galápagos Islands: Panama Bay; Mazatlán, Gulf of California; Bahama Islands; West Indies) ----- *Arcos*³¹ Schultz
- 8b. Gill membranes joined opposite third to seventh upper pectoral fin rays somewhat more anteriorly than in *Cotylis*; incisorlike teeth at front of lower jaw not projecting horizontally forward but curved obliquely upward so as to be nearly opposite those in upper jaw, the pair of incisors at middle of lower jaw nearly same size as adjoining ones; outer surface of pectoral fin base with a distinctly fleshy pad, posterior margin free and joined opposite attachment of gill membranes (Bahamas and West Indies; Texas, Central America to Brazil in Atlantic; Gulf of California to Colombia and Cocos Island in Pacific, *Gobiesox* Lacepède). Disk much greater than distance from tip of chin to front of disk; origin of dorsal fin equidistant between midcaudal fin base and rear one-third of pectoral fin rays or a little behind them; anal origin under fifth dorsal fin ray, behind middle of base of rays of that fin; teeth of lower jaw not projecting forward in a nearly horizontal position but directed nearly straight upward in adults, a little more oblique in young specimens; head 2.2 to 2.7, disk 2.6 to 3.3 and depth 4 to 5.5, all in standard length; dorsal rays 8 or 9, anal 5 to 7, pectoral 18 to 21; anus equidistant between anal origin and rear margin of disk or a little nearer to anal origin; eye $1\frac{1}{2}$ (young) to 5 (adults) times in interorbital space; length of disk when measured from its rear margin reaching nearly to end of anal fin usually from midbase to base of last anal ray; small dark spot often present near front of base of dorsal fin (Costa Rica, West Indies, to Brazil).

Gobiesox cephalus Lacepède

Genus ARBACIOSA Jordan and Evermann

Arbaciosa JORDAN and EVERMANN, in Jordan, Proc. California Acad. Sci., ser. 2, vol. 6, p. 230, 1896. (Genotype, *Gobiesox humeralis* Gilbert.)

ARBACIOSA FASCIATA (Peters)

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³¹ Not yet reported from Venezuela.

1868 (Puerto Cabello).—JORDAN, EVERMANN, AND CLARK, Rep. U. S. Comm. Fish. for 1928, pt. 2, p. 490, 1930 (Puerto Cabello).

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Genus COTYLIS Müller and Troschel

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COTYLIS NIGRIPINNIS NIGRIPINNIS Peters

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Genus GOBIESOX Lacepède

Gobiesox LACEPÈDE, Histoire naturelle des poissons, vol. 2, p. 595, fig., 1800. (Genotype, *Gobiesox cephalus* Lacepède.)

GOBIESOX CEPHALUS Lacepède

Gobiesox cephalus LACEPÈDE, Histoire naturelle des poissons, vol. 2, pp. 595, 596, fig., 1800 (fresh-water rivers of South America).

The following specimens in the collections of the U. S. National Museum were collected by Lyon and Robinson on August 1 and 2, 1900, at Macuto, near La Guaira, in a fresh-water stream.

U.S.N.M. No. 93815 to 93817, 8 specimens, 115 to 145 mm. in standard length.

U.S.N.M. No. 93820 to 93822, 5 specimens, 73 to 100 mm.

U.S.N.M. No. 93827, 3 specimens, 124 to 132 mm. in standard length.

Order BATRACHOIDEA

Family BATRACHOIDIDAE: Toadfishes

Genus BATRACHOIDES Lacepède

Batrachoides LACEPÈDE, Histoire naturelle des poissons, vol. 2, p. 451, 1800. (Genotype, *Batrachoides tau* Lacepède.)

BATRACHOIDES SURINAMENSIS (Bloch and Schneider)

SAPO DE MAR

Batrachus surinamensis BLOCH AND SCHNEIDER, Systema ichthyologiae, p. 43, 1801 (Surinam).

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Order PEDICULATIFORMES

Suborder ANTENNARIOIDEA

Family OGCOCEPHALIDAE: Batfishes

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MURCIÉLAGO DE MAR

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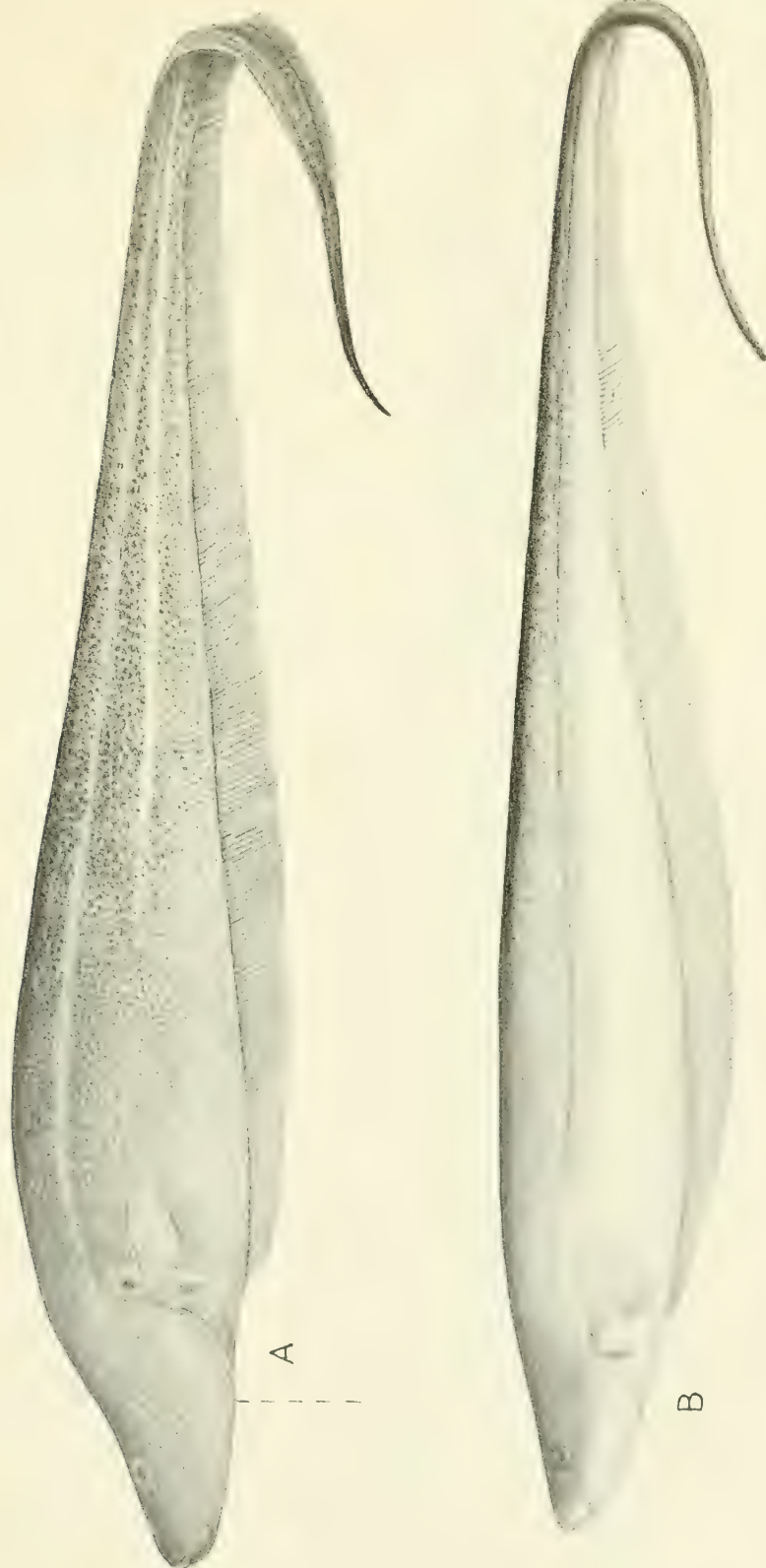
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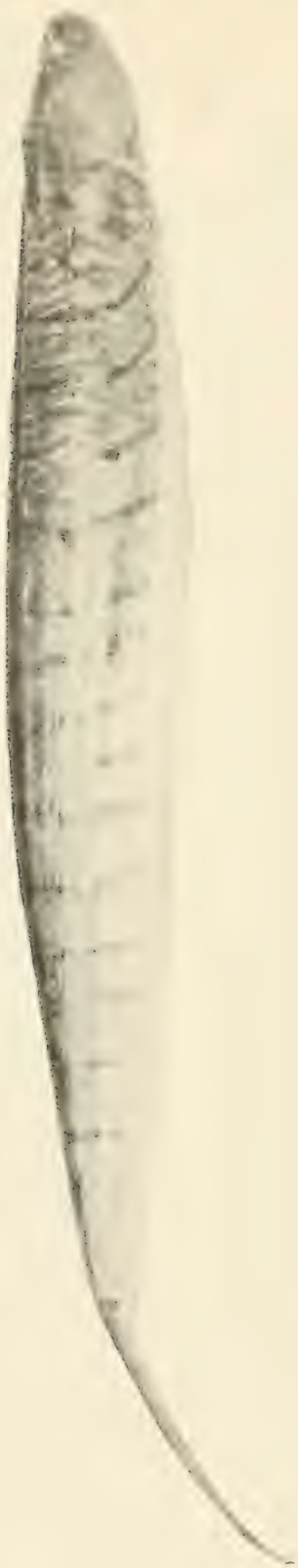
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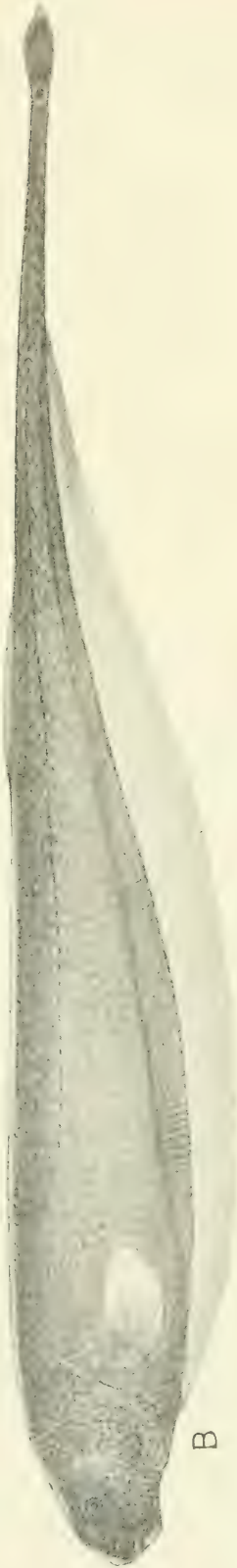
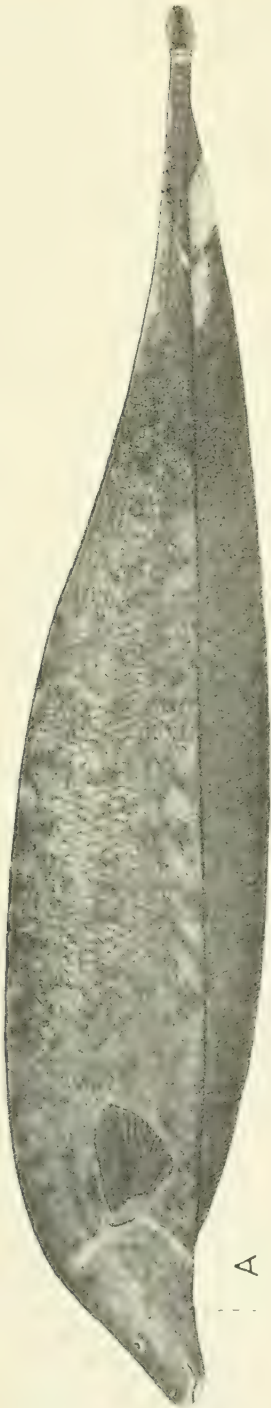
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A, *Sternopygus pejeraton*, new species: Holotype (U.S.N.M. No. 121572), 505 mm. in total length; B, *Eigenmannia goajira*, new species: Holotype (U.S.N.M. No. 121596), 500 mm. in total length. Drawings by Mrs. Aime M. Awl.



Hypopomus beebei Schultz: Holotype (U.S.N.M. No. 120753), 136 mm. in total length. Photograph.



A, *Apterionotus cuchillo*, new species: Holotype (U.S.N.M. No. 121591), 363 mm. in total length; B, *Sternarchogiton cuchillo*, new species: Holotype (U.S.N.M. No. 121600), 168 mm. in total length. Drawings by Mrs. Aime M. Awl.



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THE WEEVILS OF THE GENUS *TACHYGONUS* IN THE
UNITED STATES NATIONAL MUSEUM, WITH DESCRIPTIONS
OF NEW SPECIES

By OSCAR MONTE¹

THE author received from the United States National Museum to be studied a fine collection of weevils of the genus *Tachygonus*² Schoenherr numbering 47 specimens, comprising 20 species, of which 12 are new to science, some of these being represented by unique types. There are also several new geographical records.

He takes the opportunity to express his thanks to the authorities of the United States National Museum for their permission to study this material and to L. L. Buchanan, of the Bureau of Entomology and Plant Quarantine, for the offer of specimens in his charge for the study of this interesting genus from South and Central America. The author is greatly indebted also to Mrs. Ruth C. Altieri for making the fine illustrations.

The type specimens of new species described herein are in the collection of the United States National Museum. Certain paratypes have also been deposited, as indicated in the text, in the Monte collection.

TACHYGONUS RUFUS Hustache

Four specimens, Viçosa, Minas Gerais, Brazil, April 14, 1933, collected by E. J. Hambleton, taken on an undetermined species of Apocynaceae. The original description was based upon three specimens collected at Jatahy, Goiaz, Brazil.

¹ The author of this paper was connected with the Instituto Biológico, São Paulo, Brazil. He died on July 1, 1948, after his manuscript had been submitted for publication.—EDITOR.

² Coleoptera: Curculionidae.

Three specimens have the posterior tibiae blackish. This character is not mentioned in the original description; the fourth specimen has the tibiae of the same color as the elytra, and this color is variable from reddish yellow to ferruginous. The pectinate white scales are not so scattered. The author thinks such characters do not differ sufficiently to warrant a varietal description.

Length 1.65–1.73 mm. (type 1.5 mm.); width 1.13 mm.

TACHYGONUS BUCHANANI, new species

FIGURE 21

Black, shining, the anterior and intermediate legs and posterior tarsi ferruginous. Head pitted, with a patch of pectinate white scales on the sides. Rostrum ferruginous, with the basal portion blackish, strongly pitted and with sparse, short, yellowish bristles laterally, the central area smooth. Antennae yellowish, the club paler.

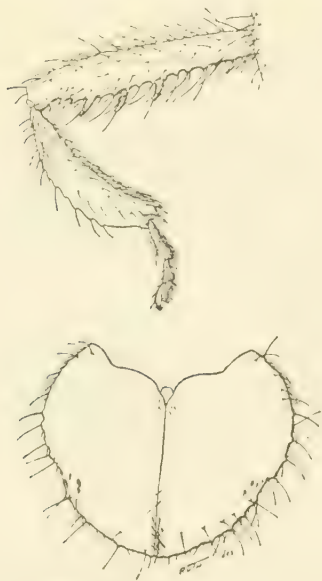


FIGURE 21.—*Tachygonus buchanani*, new species, $\times 5$.

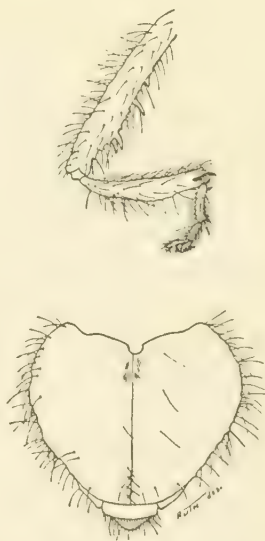


FIGURE 22.—*Tachygonus bicolor*, new species, $\times 5$.

Pronotum thickly pitted laterally, rather sparsely so medially, with a few black, erect hairs, except along the narrow smooth median space; the flanks of the pro-, meso-, and metathorax thinly covered with pectinate white scales, the scales sparser on the mesothorax than on the other two segments.

Elytra very broad, cordiform, flat to the third interstice, strongly declivous posteriorly, deeply pitted, and covered with long, brown-red hairs; two or three forked scales in postscutellar region; suture toward apex with a few yellowish-white setae; elytra a short distance

beyond the middle with a series of setae in two transverse rows, forming a faint band from the sixth to tenth interstices.

Posterior femora dark, thicker apically than basally, granulose, covered with black and white setae, the latter most numerous on the basal half; armed with numerous scattered minute teeth and with three long, black teeth, the second slightly the longest, first and third subequal, the most distal of the three teeth placed on the interior edge, the other two on the exterior edge. Posterior tibiae rather broad, arcuate, provided with strong, erect setae on the external border, and long adpressed ones within. Tarsi ferruginous and covered with long white hairs.

Length 2.17 mm.; width 1.73 mm.

Type.—U.S.N.M. No. 58186.

One specimen, Teffé, Amazonas, Brazil, December 10, 1919. Collection Bovie through Buchanan.

This species is most closely allied to *T. guerini* Monte but is smaller; elytra with the interstices lower, the pits deeper, and with the pectinate white scales on the external margin extending across the middle; the posterior femora with fewer teeth. It is smaller than *T. hydropticus* Chevrolat, a species which has the teeth on the posterior femora differently placed. The species is named in honor of L. L. Buchanan, who has taken great interest in weevils.

TACHYGONUS BICOLOR, new species

FIGURE 22

Black, shiny. Legs yellowish. Rostrum smooth, dark at base with the sides pitted, the tip ferruginous. Antennae yellowish white. Prothorax and elytra densely covered by testaceous and whitish hairs. Prothorax with shallow pits; the sides of the prothorax and of the meso- and metathorax densely covered with white pectinate scales.

Elytra very broad, lightly pitted, apical third of the suture with some crossed, erect, yellow setae; a scutellar patch on each elytron with pectinate white scales; the pectoral channel and the last (third and fourth visible) abdominal segments covered densely with white scales, the genital (fifth) segment with long white hairs instead of scales.

Posterior femora very elongate, covered with long, black and white hairs, armed with three long, strong teeth, two of which are opposite each other, forming a pair at apical two-sevenths, the other principal tooth submedian, the latter placed between two very short teeth. Posterior tibiae swollen, arcuate, yellowish, but with the external border reddish.

Length 2.17 mm.; width 1.56 mm.

Type.—U.S.N.M. No. 58187.

One specimen, Bolivia, Huachi, Beni. W. M. Mann, 1922. Mulford Biol. Expl., 1921-22.

Closely related to *T. rufovaricus* Kirsch but distinguished by the color of the posterior legs and by the shape and larger size of the posterior tibiae.

TACHYGONUS MONTANUS, new species

FIGURE 23

Black, shiny, rounded subquadrate, with a red, arrow-shaped mark on the elytra (formed by a reddish sutural line, which is branched near the postscutellar patch).

Prothorax black, shiny, sparsely pitted; the flanks red and covered by pectinate scales, which are spread along the dorsal and basal edges. Flanks of meso- and metathorax densely clothed with white pectinate scales.

Rostrum black, but testaceous at tip; the sides pitted. Antennae cream white.

Elytra black, shiny, with two dense white postscutellar tufts; the interstices raised; terminal part of the suture with a series of about eight pairs of short, yellow, strongly crossed setae. Abdominal segments with white hairs and a few white pectinate scales.

Anterior and intermediate legs yellowish; the posterior ones black, with the femora reddish apically, and armed with several small teeth and also with four long teeth, one pair at apical two-sevenths, one tooth at the middle and basad of this a shorter one. Posterior tibiae sinuate, with short, yellowish setae. Hind tarsi with the first segment ferruginous, the rest missing.

Length 1.73 mm.; width 1.30 mm.

Type.—U.S.N.M. No. 58188.

One specimen, Bolivia, Cosincho, Beni, collected by G. L. Harrington.

Near *T. neivai* Monte but distinguished by the posterior femora being totally black and narrower at tip.

TACHYGONUS MIRUS, new species

FIGURE 24

Ferruginous, with dark spots somewhat variable in size and location. Head dark, its dorsal surface with small, somewhat elongate punctures separated by very narrow, longitudinal, more or less cariniform lines, this sculpture less distinct laterally; sides of head with some white pectinate scales. In one of the paratypes the dark color of head is separated by a narrow reddish streak.

Antennae whitish yellow. Rostrum dark brown, lighter at apex, with strong pitting at base and flanks. Dorsum of prothorax dark,

shiny, very little pitted, and bearing long brown hairs, which are present also on elytra; flanks of prothorax ferruginous, densely covered with white pectinate scales, which extend along the basal margin. The flanks of meso- and metathorax covered by dense white scaling, forming layers. Elytra widened in front, narrowing toward the apex, with numerous wide but shallow pits; interstices raised; base dark, this color extending on external margins to nearly half the length, declivity with two patches of the same color; postscutellar region marked by two patches of white pectinate scales; lateral margins of elytra with a series of white pectinate scales; sutural interstices with a series of crossed white setae. In one of the paratypes the same type of scaling can be noted on last interstices. Genital segment with white erect hairs.



FIGURE 23.—*Tachygonus montanus*, new species, $\times 5$.

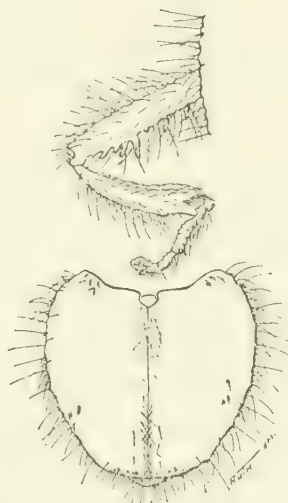


FIGURE 24.—*Tachygonus mirus*, new species, $\times 5$.

Posterior femora with basal two-thirds dark and apical third ferruginous and with white and dark hairs, the white ones more numerous on basal two-thirds and the dark on apical third; granulose, armed with 4 long teeth, 2 of which are better developed and form a pair at about apical two-sevenths, 1 tooth at middle, and another at basal third, and also with a series of about 10 small teeth, some almost reduced to tubercles, the 2 near apex larger. Hind tibiae ferruginous, dark on external margin, slightly spatulate, bearing various brown hairs. Hind tarsi yellow, with plentiful white hairs.

Underside of body dark.

Length 2.39 mm.; width 1.65 mm.

Type.—U.S.N.M. No. 58189.

Four specimens, San Miguel, Peru, two collected on September 1, 1911, and the other two, including the type, in July 1911, by the Yale Peruvian Expedition, at 6,000 feet. One paratype in the collection of the author.

These specimens suggest *T. rufovarius* Kirsch, described from Peru, because one of them has black patches on the elytra placed as called for in the original diagnosis of this species, but *mirus* differs by having the tibiae and base of femora darker, by having the pronotum not densely pitted, the elytra elongated, the femoral teeth, of which four are well developed, different, and in being larger.

TACHYGONUS COMPTUS, new species

FIGURE 25

Shiny black; anterior and intermediate legs yellow, with apex of the tibiae usually dark and with various whitish hairs, and two fringes formed by curved and golden hairs, one fringe on inner edge and extending entire length of tibiae, the other, on outer edge, short, apical and extending to a little above the tibial claw; all the tarsi dark with last segment paler.

Head strongly pitted, sparsely so on sides, and there with small pectinate scales.

Rostrum smooth, shiny and dark, slightly ferruginous at apex. Antennae light yellow.

Prothorax black, shiny, pitted, dorsal pitting smaller. flanks with abundant pectinate white scales. Flanks of meso- and metathorax, and posterior margins of abdominal segments with dense pectinate white scales which in some places form layers.

Elytra black, cordiform, the white postscutellar patch well marked, each sutural interval with a series of white setae, the setae crossing in about apical half of elytra.

Posterior femora armed with a series of numerous small tubercles and with four well-developed teeth, a subapical pair of which the inner tooth is a good deal larger than outer, a rather long submedian tooth, and, in line with it, a smaller one at about basal third; distad of the subapical pair of larger teeth are two or three small teeth on inner edge. Hind tibiae more or less thickened, with numerous tubercles on external and internal margins; white and brown hairs spread over femora and tibiae. Hind tarsi covered with pale hairs, dark, the last segment yellow.

Length 2.17 mm.; width 1.41 mm.

Type.—U.S.N.M. No. 58190.

Five specimens; four, including the type, from San Miguel, Peru (6,000 feet), September 1, 1911, and one specimen from Paltaybamba (5,000 feet), August 6, 1911, Yale Peruvian Expedition. One paratype in the collection of the author.

Similar to *T. rugosipennis* Hustache but differs by having the femora more pointed and the femoral teeth differently placed, the scaling denser and the elytra somewhat narrower. Differs from *T. scutellaris* Kirsch in the pectinate scales of abdomen, by the posterior legs being totally black, and by the nonflattened tibiae.

TACHYGONUS CASEYI Champion

Two specimens, Bequeren, Puerto Rico, Cabassa Finca, R. G. Oakley, collector. On *Guacima guacima*. Heretofore known from Mexico and Guatemala.

TACHYGONUS NIGER, new species

FIGURE 26

Shining black, the first two pairs of legs light brown. Rostrum ferruginous, dark at base, smooth and shining, slightly pitted at sides and with a small depression at base.

Head rugose, with a few scales laterally. Antennae yellowish, with a silky white club.



FIGURE 25.—*Tachygonus comptus*, new species, $\times 5$.



FIGURE 26.—*Tachygonus niger*, new species, $\times 5$.

Dorsum of prothorax smooth, shallowly pitted and with some fine hairs; flanks covered with pectinate white scales.

Elytra wide, with salient shoulders, strongly pitted and with whitish yellow hairs over whole surface and with setae of same color on declivity. The white pectinate scales in postscutellar spot every dense. Flanks of meso- and metathorax covered with same type of scales, these more numerous on mesothorax.

Hind femora long, granulated, with light and dark hairs, armed with numerous small teeth reduced to tubercles and with three well-developed teeth, a subapical pair and one submedian tooth; there are

also four smaller teeth, three situated between subapical pair and apex of tibia, the fourth based of the submedian tooth. Hind tibiae paler than femora, serrated on inside, curved and bearing white and dark hairs, tarsi with first two segments ferruginous and the last two yellowish, all covered with white hairs.

Length 2.00 mm.; width 1.39 mm.

Type.—U.S.N.M. No. 58191.

One specimen, Las Mercedes, Santa Clara, Costa Rica, 200 to 300 meters, collected by F. Nevermann, December 1921.

Extremely close to *T. curvicius* Champion but differentiated in the placing of the hind femoral teeth. The present species has four teeth, a pair close to apex, one more or less in the middle, another at the basal third; there are several others almost reduced to tubercles.

Differentiated from *T. femoralis* Monte by the shape of the femora.

TACHYGONUS LATICRUS Champion

Two specimens, Coronado, Costa Rica (1,400 to 1,500 meters), collected by F. Nevermann, May 24, 1925, on leaves of *Inga edulis*.

This species is of the same group as *guerini* Monte and *bondari* Marshall. It is distinguished from *guerini* by its smaller size, fewer teeth on posterior femora, and by its shorter and stouter tibiae.

Length 2.39 mm.; width 1.91 mm.

TACHYGONUS FERRUGINEUS, new species

FIGURE 27

General color ferruginous; fore and middle legs yellowish; hind legs dark brown. Rostrum of same color as elytra.

Head slightly darker than prothorax, upper surface with some fine, longitudinal punctate striations, flanks with white scaling and with pitting which becomes somewhat denser close to eyes. Antennae ferruginous, with whitish club.

Prothorax with wide and shallow pits; flanks of pro-, meso-, and metathorax covered with pectinate white scales. Elytra and dorsum of prothorax with long, erect, yellow hairs.

Elytra wide and flattened, shoulders slightly produced; besides the hairs strong setae are present, some of the setae fringing external margin of elytra; postscutellar region with a few white scales.

Posterior femora very long, dark brown, lighter at base, granulose, with a pair of subapical teeth, and a smaller submedian tooth, and also a series of small teeth along inner edge; tibiae spatulate, dark, paler at base, the external margin with a series of four to five rigid, erect setae, the internal margin with abundant hairs. Hind femora and tibiae with various white and brown hairs. Hind tarsi with first

two segments ferruginous and the last two yellow, all covered by dense white hairs.

Underside of body dark.

Length 1.82 mm.; width 1.30 mm.

Type.—U.S.N.M. No. 58192.

One specimen from Guapiles, Santa Clara, Costa Rica, collected by F. Nevermann, February 17, 1924.

Perfectly distinct from all described species.

TACHYGONUS ATRO-SIGNATUS, new species

FIGURE 28

General color brown, elytra lighter than prothorax and marked with dark patches of which the largest is close to the shoulder.

Head light brown with a small, dark, median patch close to eyes, and laterally with numerous white scales.

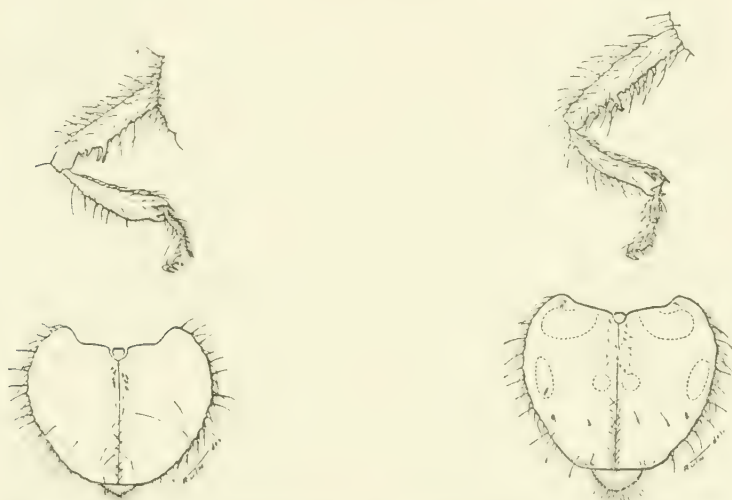


FIGURE 27.—*Tachygonus ferrugineus*, new species, $\times 5$.

FIGURE 28.—*Tachygonus atro-signatus*, new species, $\times 5$.

Rostrum rather stout, brown, darker medially, strongly pitted at sides. Antennae yellowish, club whitish and covered with silky hairs.

Prothorax ferruginous, dorsum dark and with wide but shallow pits and erect brown hairs; flanks with abundant whitish-yellow scales.

Elytra with deep pits and raised interstices, pale ferruginous, tinged with black near shoulders, laterally, and a little posterior to the postscutellar patch; postscutellar patch formed of white, pectinate scales; apical part of the suture with yellowish-white crossed setae. Flanks of meso- and metathorax with pectinate white scales.

Front and middle legs yellowish; hind legs ferruginous. Posterior femora with numerous small tubercles and with four big teeth, two

at about apical third, one median, and one behind middle, the last the smallest. Hind tibiae darkish brown covered with white and dark hairs. Hind tarsi yellowish and densely covered with long white hairs.

Length 2.21 mm.; width 1.48 mm.

Type.—U.S.N.M. No. 58193.

One specimen, Hamburg Farm, Reventazón, Ebene Limón, Costa Rica, F. Nevermann, collector, on a shrub, August 10, 1924.

This species is chiefly distinguished by the disposition of the teeth on the posterior femora and by the dark spots on the elytra.

TACHYGONUS VALIDUS, new species

FIGURE 29

Black, the elytra slightly brown at the shoulders. Prothorax pitted dorsally, the pits larger at sides than medially. The whole body bearing long dark-brown hairs. The sides (flanks) of the pro-, meso-, and metathorax with white pectinate scales. Elytra wide, the pitting rough, shoulders salient, a few white pectinate scales in the post-scutellar region forming a vaguely defined patch, suture from this patch to apex with a series of brown, crossed setae.

Anterior and intermediate legs yellowish; posterior legs with femora dark medially, reddish at the apex and base, the basal reddish part with abundant white hairs which are more numerous on the external surface. Hind femora granulose, the dark median part with four stout teeth on the internal edge (two larger and two smaller) and also with two on the external edge, of which the antemedian tooth is opposite one of the large teeth on internal side and forms a pair with it, the second of the external teeth quite distant from the others and placed slightly beyond basal third of femur. Hind tibiae curved and widening toward the apex, which is ferruginous and bears a few white pectinate scales; remainder of tibia dark and covered with abundant dark hairs; hind tarsi ferruginous and covered with white hairs.

Length 2.82 mm.; width 2.08 mm.

Type.—U.S.N.M. No. 58194.

One specimen taken by Dr. R. E. Blackwelder, at Ciricito, Panama (Canal Zone), March 3, 1930.

Similar to *T. quinquedentatus* Champion but differentiated by the femoral teeth, by the widening of the hind tibiae, and by the indistinct postscutellar patch, which is formed by about six pectinate scales on each side of the suture. Near to *T. bondari* Marshall, but smaller, with narrower tibiae, the femora with four teeth on the inside (two larger and two smaller) and small tubercles, and with two teeth widely separated from each other on the external side.

TACHYGONUS FEMORALIS, new species

FIGURE 30

Shiny black; fore and middle legs yellowish, hind legs with ferruginous femora and black tibiae. Rostrum ferruginous. Antennae yellowish white.

Prothorax smooth and sparsely pitted above, with few erect hairs, flanks with abundant white pectinate scales; flanks of meso- and metathorax with similar scales, these more abundant on metathorax.

Elytra dark, lightly ferruginous in the center; a white patch formed by pectinate scales, on the postscutellar region; yellowish, crossed setae along the suture and long, fine hairs dispersed over the elytral surface.



FIGURE 29.—*Tachygonus validus*, new species, $\times 5$.



FIGURE 30.—*Tachygonus femoralis*, new species, $\times 5$.

Posterior femora much thickened (which characterizes the species), constricted at the apex, bearing small tubercles and long white hairs basally, and brown hairs apically; femoral teeth placed as follows: On the inside a large one at about apical fourth, and two very small ones distad of it; on the external side are two short ones of which the more distal is fairly large and opposite the large tooth on the internal side, the next one (proceeding toward base of femur) reduced nearly to a tubercle, this followed by three others of which the second is well developed on the left femur but much reduced on the right.

Hind tibiae dark and curved, the internal surface slightly serrated and covered with white hairs. Hind tarsi dark brown, the last segment yellowish, all segments covered densely with white hairs.

Length 2.00 mm.; width 1.52 mm.

Type.—U.S.N.M. No. 58195.

One specimen, Porto Bello, Panama (Canal Zone), collected by A. Busck, February 20, 1911.

Close to *T. curvicerus* Champion but with more teeth on the femora and with much thickened femora (thicker than the tibiae).

TACHYGONUS SEMIRUFUS Champion

Six specimens, Paraiso, Panama (Canal Zone), collected by E. A. Schwarz, January 26, March 16, April 17, and May 10, 1911.

Sometimes the color is red brown, in this case the posterior femora and tibiae are dark, but lighter on the apex of the former and on the base of the latter.

TACHYGONUS GOWDEYI Marshall

Eight specimens, El Salvador, on madre de cacao, A. K. Salman, collector, March 20, 1925.

TACHYGONUS NITIDUS, new species

FIGURE 31

Shining black; front and middle legs, basal two-thirds of the hind femora, and entire hind tarsi ferruginous.

Rostrum with basal half darker and with whitish hairs near the eyes. Head with delicate pitting.

Prothorax with wide but shallow pitting, upper surface with brown, erect hairs, the flanks with fine, white, pectinate scales, which are also present on the flanks of meso- and metathorax, the scales on metathorax more abundant on metepisternum than on sides of metasternum.

Elytra with deep pitting, each pit being the origin of a fine light-brown hair, the interstices with longer ones of the same color. Post-scutellar patch wanting.

Posterior femora with the basal two-thirds ferruginous, the remainder black. White hairs are present on the basal part and black ones on the apical. The femora are armed with five teeth on the internal side, the one nearest apex very short, the second longer, the remainder gradually diminishing in length. Hind tibiae black, slightly serrated inwardly, with hairs subappressed, the external margin with a few erect setae. Hind tarsi brown, with short, dark hairs.

Length 1.56 mm.; width 1.21 mm.

Type.—U.S.N.M. No. 58196.

Two specimens, Trece Aguas, Alta Vera Paz, Guatemala, collected by Schwarz and Barber, on cacao, April 18, 1906.

Very near to *T. gowdeyi* Marshall but distinguished by the absence of the postscutellar patch and by the placing of the femoral teeth. *T. bidentatus* Champion is another allied species.

TACHYGONUS FLOHRI Champion

One specimen, Trece Aguas, Alta Vera Paz, Guatemala, on cacao, Schwarz and Barber, collectors, April 4.

TACHYGONUS RUGOSUS, new species

FIGURE 32

Shiny black; pronotum, elytra, femora, and tibiae bearing plentiful long, erect, rigid, black setae; postscutellar patch wanting, base of pronotum at middle with a small tuft of white pectinate scales.



FIGURE 31.—*Tachygonus nitidus*, new species, $\times 5$.

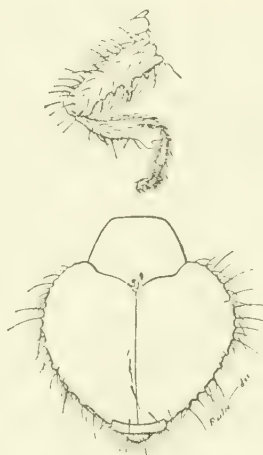


FIGURE 32.—*Tachygonus rugosus*, new species, $\times 5$.

Pronotal pits sparse but wide; flanks of prothorax covered with pectinate white scales. Flanks of meso- and metathorax covered with similar scales, these more abundant on the metathorax.

Antennae ferruginous, club lighter. Rostrum dark brown, sides with delicate yellow hairs.

Elytra rugose, interstices distinctly raised, pits wide and deep. Abdominal sternites laterally with a few white pectinate scales.

Posterior femora thick, black with yellowish apex, rugose, pits wide but sparse; armed with a long, strong tooth situated between two shorter ones, and with various small tubercles placed in lines on the

two margins. Posterior tibiae short, black, yellow at extreme base, rugose, internal side with light-brown hairs, the external side with about four strong, erect setae. Hind tarsi light brown, with dark and rigid setae on upper side, and abundant white hairs on under.

Length 1.82 mm.; width 1.48 mm.

Type.—U.S.N.M. No. 58197.

One specimen, Cordoba, Mexico, collected by Frederick Knab, April 8, 1908.

Close to *T. pectinisquamis* Champion but without scutellar patch. *T. rugosus* is characterized by the short femora and by the patch of erect scales on base of pronotum.

TACHYGONUS MINUTUS Blatchley

Three specimens, Tampico, Mexico, collected by E. A. Schwarz.

Length 1.30 mm.; width 0.86 mm.

TACHYGONUS PECTINISQUAMIS Champion

One specimen, Temescaltepec, Mexico, May 20 to June 4, H. E. Hinton and R. L. Usinger, collectors, collection E. C. Zimmerman, 1941, which does not agree exactly with the description of *pectinisquamis*, but whether the apparent differences are significant or not could only be determined by a comparison with the type.

Length 1.65 mm.; width 1.13 mm.

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THE SPECIES OF ICHNEUMON-FLIES OF THE GENUS
CARDIOCHILES OCCURRING IN AMERICA NORTH OF
MEXICO

By YING-TOU MAO

THE Cardiochilinae are a comparatively small subfamily of ichneumon-flies of the family Braconidae. *Cardiochiles* Nees is the only genus in North America. It is a distinct group, differing rather noticeably from other Braconidae in having the third abscissa of radius arched forward (pl. 4, figs. 4, 5). The species tend to fall into two well-defined groups, one with hairy eyes and the habitus of a microgasterine and the other with bare eyes and the habitus of a sawfly. Although apparently best represented in the southern part of the United States, *Cardiochiles* occurs as far north as southern Canada. Little is known concerning the host relationships of members of the genus. The hosts are probably always lepidopterous larvae, but few species have been reared. *C. nigriceps* Viereck is a conspicuous exception. It has been obtained abundantly from larvae of the tobacco budworm, *Heliothis virescens* (Fabricius).

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M. M. Carpenter for arranging interlibrary borrowings. In addition, thanks are due E. T. Cresson, Jr., of the Academy of Natural Sciences of Philadelphia, for the loan of the *Cardiochiles* collection of that institution for study and to Prof. H. B. Hungerford, of the University of Kansas, for the loan of the type of *Cardiochiles nigroclypeus* Viereck.

Subfamily CARDIOCHILINAE Ashmead

Cardiochilinae ASHMEAD, in Smith, Insects of New Jersey, p. 592, 1900; Proc. U. S. Nat. Mus., vol. 23, p. 129, 1901.—SZÉPLIGETI, in Wytsman, Genera insectorum, fasc. 22, p. 142, 1904.

Frons impressed and with a more or less distinct median longitudinal carina; scape and pedicel polished, flagellum dull; cheek, temple, and occiput not margined; clypeus not impressed to form a rounded depression with the mandibles; mandibles crossing at tips. Mesonotum with notaulices meeting, usually in an acute angle; mesopleuron with a foveolate groove at its posterior margin; prepectus margined or not; forewing with three cubital cells, the second cell longer than wide; radial cell elongate, extending to near the apex of wing; third abscissa of radius curved or subangulate basally; subdiscoidal vein originating below middle of discoidal vein; nervulus postfurcal; stigma broad or lanceolate; hind wing with radiellian cell divided. Abdomen subsessile, with the usual sutures; articulation between second and third tergites rigid.

Genus CARDIOCHILES Nees

Cardiochiles NEES, Nov. Acta Acad. Nat. Caes. Leop. Carol., vol. 9, p. 307, 1818, no species; Hymenopterorum ichneumonibus affinium monographiae . . . , vol. 1, p. 224, 1834, one species. (Type, *Ichneumon saltator* Fabricius, first included species.)

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Ditherus CAMERON, Journ. Bombay Nat. Hist. Soc., vol. 14, p. 434, 1902. (Type, *D. ruficollis* Cameron.) (Monobasic.)

Schönlandella CAMERON, Rec. Albany Mus., vol. 1, p. 169, 1904. (Type, *S. nigromaculata* Cameron, by designation of Viereck, 1914.)

Ernestiella CAMERON, Spolia Zeylanica, vol. 3, p. 81, 1905. (Type, *E. nigromaculata* Cameron.) (Monobasic.)

¹*Hartemita* CAMERON, Wien. Ent. Zeit., vol. 29, p. 99, 1910. (Type, *H. latipes* Cameron.) (Monobasic.) (New synonymy.)

²*Psilommiscus* ENDERLEIN, Arch. Naturg., vol. 78, p. 98, 1912. (Type, *P. sumatranus* Enderlein.) (Monobasic.) (New synonymy.)

¹This new generic synonymy is on the authority of C. F. W. Muesebeck who has seen the genotypes.

Eye hairy or bare; scape and pedicel shining and with longer pubescence than the flagellum; antennae multiarticulate, the number of segments not constant within species; scape rather stout, pedicel short and globular; face 1.0 to 3.0 times as wide as long and usually with a medial tubercle or short ridge above, or with a median longitudinal carina; occiput more or less concave, immargined; notaulices always distinctly impressed, usually foveolate, rarely smooth; prepectus immargined; mesopleuron with upper, lower, and posterior grooves (pl. 4, fig. 3), the first two foveolate or smooth, the posterior groove always foveolate; propodeum usually rugose and usually areolated; third abscissa of radius arched or subangulate basally; interanal vein represented by a short stump continued as a pigmented line, or by a pigmented line only, rarely absent; hind tibia sometimes simple but often somewhat compressed and broadened more or less toward apex, which may be expanded into a flaring process; hind basitarsus more or less flattened; tibial spurs long, hind tarsal claws usually pectinate or toothed; first abdominal suture curving slightly to the margin or extending obliquely forward to the margin (pl. 4, figs. 10, 11); second tergite usually shorter than, rarely as long as, the third; ovipositor sheath short or long but never longer than the abdomen.

CARDIOCHILES ABDOMINALIS (Cresson)

Toxoncuron abdominale CRESSON, Can. Ent., vol 5, p. 68, 1873 (male).

Toxoncurea abdominalis ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, pp. 49, 51, 1894.

Cardiochiles abdominalis ASHMEAD, in Smith, Insects of New Jersey, p. 592, 1900.

Female.—Length 6.5 mm. Head and thorax black; inner orbit narrowly, outer broadly, and ventral incompletely, ferruginous, eye grayish black; clypeus pale ferruginous, its apical margin black; wings fuliginous; legs ferruginous, except coxae, trochanters basally, and femora basally, black and hind tarsi dusky; abdomen ferruginous; ovipositor sheath black. Antenna around 32-segmented; eye bare; ocelli elevated; vertex smooth, polished; frons polished with a slight depression below anterior ocellus followed by a weak, median, longitudinal elevation; face about 2.50 times as wide as long, punctate, convex, with a short median ridge above and below this slightly elevated; clypeus punctate, its median basal portion elevated, its apical margin slightly flaring, and not notched; temple bulging, wider than eye in dorsal view; malar furrow about 0.67 as long as the basal width of the mandible; galea tapering, slightly shorter than the long axis of the eye. Posterior portion of lateral face of pronotum rugose medially; median lobe of mesoscutum with a shallow longitudinal depression each side of the median line; notaulices moderately foveolate; upper groove of mesopleuron foveolate; lower groove weakly foveolate; pos-

terior groove coarsely rugose with a smooth depression at the middle anterior to the groove; metapleuron rugose, median lower part of anterior portion smooth; propodeum rugose, carinae of areola moderately distinct but costulae not well defined, spiracle ovate. First abscissa of radius longer and thicker than that of basal vein; third abscissa of cubitus longer than fourth; recurrent vein and second abscissa of cubitus about equal; nervulus postfural by about 0.67 of its own length; first abscissa of submedius slightly shorter than second; interanal vein represented by a short pigmented stump. Fifth segment of fore tarsus longer than second; apex of hind tibia thickened and expanded outwardly into a flaring process; inner spur of middle tibia about 0.67 as long as basitarsus, second and fifth segments of middle tarsus about equal; inner spur of hind tibia about half as long as basitarsus, which is slightly longer than the next three tarsal segments combined, second and fifth tarsal segments about equal. First abdominal suture slightly curved to the margin; second tergite shorter than third medially; hypopygium about as long as the first three tergites combined, plow-share-shaped, ovipositor sheath sparsely pubescent, spatulate, polished, its exposed part about 0.67 as long as hypopygium (pl. 5, fig. 40).

Type.—In the Academy of Natural Sciences of Philadelphia.

In addition to the type the author has examined specimens from Dallas, Tex., September 22, 1905; Addis, La., October 26, 1912; Lafayette, La., November 6, 1938; Illinois; Washington, D. C., September 16, 1883; and Tifton, Ga.

CARDIOCHILES APICALIS (Cresson)

Toxoneuron apicale CRESSON, Can. Ent., vol. 5, pp. 66, 68, 1873.

Toxoneura apicalis ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, pp. 49, 51, 1894.

Cardiochiles apicalis ASHMEAD, in Smith, Insects of New Jersey, p. 592, 1900.

Female.—Length 4.20 mm. Black, eye blackish gray; pedicel dark ferruginous apically; middle part of mandible light ferruginous; wings with apical third fuliginous, the rest hyaline; apical two-thirds of fore femur, fore tibia, apical half of middle femur, and basal third of middle tibia, ferruginous; fore and middle tarsi, apical two-thirds of middle tibia, and spurs of fore and middle tibiae, blackish. Antenna 27-segmented; eye hairy, ocelli elevated; vertex smooth, polished; frons smooth, polished, and with a median longitudinal carina; face slightly less than 2.50 times as wide as long, its median line slightly elevated and with a short tubercle above; clypeus smooth, its apical median margin distinctly notched; temple wider than eye in dorsal view; galea short. Median portion of lateral face of pronotum wrinkled; median lobe of mesoscutum nearly smooth, flat, and without a distinct depression on each side of the median longitudinal line; notaulices narrow, finely foveolate; upper groove of mesopleuron foveolate.

lower groove weakly foveolate, posterior groove coarsely foveolate; metapleuron rugose, median ventral part of its anterior portion smooth; propodeum rugose, carinae moderately high, spiracle short ovate. First abscissae of radius and basal vein about equal; third abscissa of cubitus much shorter than fourth; nervulus postfurcal by about half of its length; first abscissa of submedius shorter than second; interanal vein represented by a lightly pigmented stump. Second and fifth segments of fore tarsus about equal; apex of hind tibia not thickened or expanded into a flaring process; inner spur of middle tibia about 0.75 as long as basitarsus, second tarsal segment slightly longer than fifth; inner spur of hind tibia about 0.67 as long as basitarsus, basitarsus about as long as the next three tarsal segments combined, second tarsal segment longer than fifth; hind tarsal claws pectinate. First tergite weakly sclerotized laterally; first abdominal suture extending obliquely forward to the margin; second tergite shorter than the third medially; hypopygium in profile plowshare-shaped, about as long as the first two tergites combined, its median ventral line folded; ovipositor sheath about as long as the first five abdominal tergites combined, pubescent, slightly broadened apically, and its tip bent ventrally (pl. 5, fig. 26).

Male.—Essentially similar to the female.

Type.—In the Academy of Natural Sciences of Philadelphia.

In addition to the type the author has studied specimens from Atco, N. J., June 7, 1893; Plummers Island, Md., June 1914; Glen Echo, Md., summer, 1922; Glencarlyn, Va., June 9, 1912; Champaign, Ill.; Mount Pleasant, Iowa, May 26, 1934; Onaga, Kans.; and Chickamauga, Ga., July 10, 1898.

CARDIOCHILES ARUGOSUS, new species

Female.—Length about 5.5 mm. Head and thorax black; eye grayish black; wings light fuliginous on about apical half, subhyaline basally; legs ferruginous, coxae, fore and middle trochanters, hind trochanters basally, and fore and middle femora basally, black; hind tibia apically and apical four segments of fore and middle tarsi blackish; tibial spurs blackish, fore tibial spur ferruginous; hind tarsus black; abdomen ferruginous, first tergite black medially; ovipositor sheath black. Antenna about 38-segmented, eye bare; ocelli elevated; vertex smooth, polished; frons smooth, polished, and with a slight depression below the anterior ocellus followed by a median longitudinal elevation; face about 2.50 times as wide as long, polished, with a short median ridge above, its median line slightly elevated; clypeus smooth and polished, its apical margin not notched; temple slightly wider than eye in dorsal view; galea short. Posterior portion of lateral face of pronotum rugose medially; median lobe of mesoscutum

smooth, without a distinct longitudinal depression on each side of the median line; notaulices finely foveolate, meeting in a rather acute angle; upper groove of mesopleuron somewhat broadened, and striately partitioned, lower groove foveolate, posterior groove coarsely foveolate with a depression at the middle leading anteriorly to the lower groove; metapleuron rugose, median ventral part of anterior portion plain; propodeum rugose, carinae moderately distinct, spiracle long ovate; first abscissa of radius longer than that of basal vein; third abscissa of cubitus shorter than fourth; recurrent vein shorter than second abscissa of cubitus; nervulus postfureal by about half of its own length; first abscissa of submedius slightly shorter than second; interanal vein represented by a pigmented stump. Second and fifth segments of fore tarsus about equal; apex of hind tibia not expanded outwardly into a flaring process; inner spur of middle tibia about 0.70 as long as basitarsus, second and fifth tarsal segments subequal; inner spur of hind tibia about 0.67 as long as basitarsus, basitarsus slightly shorter than the next three tarsal segments combined, second tarsal segment longer than fifth, third and fifth tarsal segments about equal; hind tarsal claws pectinate. First abdominal suture slightly curved to the margin; second tergite shorter than third; hypopygium small, slightly shorter than first tergite, in profile rounded posteriorly, its median ventral line without a longitudinal fold; ovipositor sheath short, pubescent, its exposed part about half as long as hypopygium (pl. 5, fig. 36).

Male.—Essentially similar to the female.

Type.—U.S.N.M. No. 58282.

Type locality.—Auburn, Ala. (June 6, 1897, C. F. Baker).

Described from numerous specimens of both sexes collected at localities in Alabama, Georgia, Louisiana, New Jersey, Maryland, Virginia, Ohio, Michigan, Indiana, Illinois, Wisconsin, Iowa, South Dakota, Nebraska, Kansas, Texas, Utah, Oregon, and Ontario.

CARDIOCHILES ARUGOSUS var. PULLUS, new variety

This variety differs from typical *arugosus* only in having the wings uniformly fuliginous.

Type.—U.S.N.M. No. 58283.

Type locality.—Howell, Utah (June 7, 1930, G. F. Knowlton).

Described from eight females (one type) and four males. The paratypes are from Mount Hood, Oreg.; Riverton, N. J., June 13, 1901; Rusk County, Tex., June 18, 1940; Newell, S. Dak., June 28, 1923; Franklin County, Ohio, June 13, 1942; Onaga, Kans.; Opelousas, La., April 30, 1897; and Salt Lake City, Utah, May 3, 1928. Four paratypes are in the collection of the Academy of Natural Sciences of Philadelphia and two in the collection of Ohio State University.

CARDIOCHILES BREVITARSIS, new species

Female.—Length about 7 mm. Head black, narrow inner and broad outer orbits ferruginous; cheek ferruginous below. Thorax ferruginous, proepisternum, anterior margin of lateral face of pronotum, lower part of mesopleuron, and propodeum black, metanotum infuscated; foreleg ferruginous, coxa and trochanter black, and last tarsal segment fuscous; middle leg similar; hind leg ferruginous, coxa partly black and tarsus fuscous. Wings fuliginous, veins and stigma dark. Abdomen ferruginous. Pubescence of head chestnut-brown. Antenna (incomplete); eye bare and slightly bulging; ocelli elevated; vertex smooth and polished; frons smooth, polished, and with a median longitudinal elevation; face about 2.50 as wide as long, punctate, with a short median longitudinal ridge above; clypeus punctate, with longer pubescence than face, slightly elevated medially on basal half, apical margin, truncate, not notched; temple slightly narrower than eye in dorsal view; galea short. Median lobe of mesoscutum with a shallow longitudinal depression each side of median line; notaulices shallow and smooth; mesopleuron polished, upper and lower posterior grooves shallowly foveolate; metapleuron rugose, median lower part of anterior section smooth; propodeum rugose, carinae prominent; areola large, broader than spiracular area; spiracular area acute posteriorly, spiracle ovate. First abscissa of radius slightly longer than that of basal vein; third abscissa of cubitus shorter than fourth; recurrent vein slightly longer than second abscissa of cubitus; nervulus postfurcal by 0.67 its own length; first abscissa of submedius shorter than second; interanal vein represented by a short stump. Second and fifth segments of fore tarsus subequal; apex of hind tibia slightly thickened outwardly at apex but without a flaring process; inner spur of middle tibia about 0.67 as long as basitarsus, second segment of middle tarsus shorter than fifth; inner spur of hind tibia more than half as long as the basitarsus, second and fifth tarsal segments about equal, basitarsus broad, flattened, and shorter than the last four tarsal segments combined; hind tarsal claws pectinate, each with four to five visible teeth basally. First abdominal suture slightly curved to the margin; second tergite about half as long as third medially; hypopygium very similar to that of *rubidus*, in profile obtuse, slightly shorter than hind basitarsus, its median ventral line without a longitudinal fold. Ovipositor sheath spatulate, slender (more slender than that of *rubidus*), small, pubescent, the exposed part about 0.67 as long as the hypopygium.

Type.—U.S.N.M. No. 58284.

Type locality.—Los Angeles, Calif. (Coquillett).

Described from the type, a female paratype from San Diego, Calif., August 25, 1927, and one specimen without abdomen from Los Angeles, Calif.

CARDIOCHILES CALIFORNICUS (Ashmead), new combination

Loxonura californica ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, pp. 49, 50, 1894 (female).

Female.—Length about 6.5 mm. Black, upper orbit dark ferruginous; eye grayish black; wings light fuliginous on apical 0.40, the rest hyaline; coxae and trochanters black; tarsi blackish; femora ferruginous, more or less black basally; tibiae including spurs ferruginous. Antenna 28-segmented; eye bare; ocelli elevated; vertex smooth and polished; frons smooth, polished, with the median portion below the anterior ocellus weakly rugulose; face slightly less than 2.50 times as wide as long, punctate, and with a short median ridge above; clypeus mostly smooth, its basal half slightly elevated, its apical margin truncate and slightly arched; temple wider than eye in dorsal view; galea about two-thirds as long as the long axis of eye. Median portion of lateral face of pronotum rugose; mesoscutum and scutellum evenly punctate; median lobe of mesoscutum with a shallow longitudinal depression along each side of the median line; notaulices distinct and finely foveolate; mesopleuron finely punctate, upper groove widened posteriorly and coarsely pitted, lower groove foveolate, posterior groove strongly foveate; metapleuron rugose on posterior section, the anterior portion smooth; propodeum rugose, areola defined by low carinae, other areas not clearly delimited, pleural carinae very strong. First abscissae of radius and basal vein about equal; third abscissa of cubitus shorter than the fourth; recurrent vein and second abscissa of cubitus about equal; nervulus postfurcal by 0.67 its length; first and second abscissae of submedius about equal; interanal vein represented by a short pigmented stump. Second and fifth segments of fore tarsus about equal; apex of hind tibia thickened but not expanded into a strongly flaring process; inner spur of middle tibia about half as long as basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia about half as long as the basitarsus, which is about as long as the next three tarsal segments combined, second tarsal segment longer than the fifth; hind claws pectinate basally. Second tergite shorter than the third medially; hypopygium very prominent, plowshare-shaped, surpassing last tergite, about as long as the first five tergites combined, its median ventral line without a longitudinal fold; ovipositor sheath bare, polished, bent downward at apex, its exposed part about 0.80 as long as hypopygium (pl. 5, fig. 20).

Male.—Essentially similar to the female; antenna 33-segmented.

Type.—U.S.N.M. No. 2171.

Known only from the three specimens comprising the type series and four specimens in the Academy of Natural Sciences of Philadelphia. All are from California.

CARDIOCHILES DIGNUS, new species

Female.—Length 7.5. Black except the following: Narrow inner and broad outer orbital markings, outer half of tegula, lateral margins of first and second tergites, and a spot in each basal lateral angle of third tergite ferruginous; eye grayish black; forewing with about apical 0.40 fuliginous, the remainder yellow; stigma, part of metacarpus, costa, first abscissa of radius, basal vein, part of first abscissa of cubitus, medius, and most of submedius ferruginous; hind wing yellow on basal half, infuscated on apical half, veins ferruginous, second abscissa of metacarpella, radiella, and cubitella dark; legs ferruginous, with all coxae and trochanters black, the apical segment of hind trochanter mostly ferruginous, hind tarsi blackish; ovipositor sheath black. Antenna incomplete, 32 segments remaining; eye bare; ocelli elevated; vertex and frons smooth and polished; face about 2.50 times as wide as long, punctate, and with a low median tubercle above, below which it is broadly, slightly elevated; clypeus rougher than face, slightly elevated on basal median half, its apical margin not notched but distinctly reflexed; temple narrower than eye in dorsal view; galea short. Median portion of the lateral face of pronotum rugose; mesonotum very minutely punctate; mesopleuron minutely punctate, upper and lower grooves foveolate, posterior groove weakly foveolate; metapleuron rugose, with the basal triangular portion mostly smooth; propodeum rugose, the areola sharply defined by prominent carinae but costulae weak and indistinct, spiracular area open posteriorly, spiracle long ovate. First abscissa of radius longer than that of basal vein; third abscissa of cubitus longer than fourth; recurrent vein and second abscissa of cubitus equal; nervulus postfurcal by about its length; first abscissa of submedius shorter than second; interanal vein represented by a short pigmented stump. Fifth and second segments of fore tarsus about equal; hind tibia flattened toward apex, but not expanded into a flaring process; inner spur of middle tibia about 0.67 as long as basitarsus; inner spur of hind tibia about 0.67 as long as basitarsus; middle and hind tarsi incomplete. First abdominal suture slightly curved to the margin; second tergite shorter than third; hypopygium short, in profile obtuse, its median ventral line without a longitudinal fold; ovipositor sheath short, pubescent, its exposed part about half as long as the hypopygium (pl. 5, fig. 29).

Type.—U.S.N.M. No. 58285.

Type locality.—Victoria, Tex.

Described from a single female specimen collected April 27, 1912, by J. D. Mitchell.

CARDIOCHILES DILATUS, new species

Female.—Length 6 mm. Head and thorax black; orbits and middle part of clypeus ferruginous; middle of mandible dark red; wings fuliginous, darkest apically, stigma and costa more or less ferruginous, at least basally; coxae and trochanters black, femora ferruginous, tibiae ferruginous, apex of hind tibia blackish, fore tarsus blackish, basal half of fore basitarsus ferruginous, middle tarsus blackish, hind tarsus black; abdomen ferruginous, median portion of first tergite black; ovipositor sheath black. Pubescence of head short; antenna 32-segmented in type; eye bare; ocelli elevated; vertex smooth, polished; frons smooth, polished, with a transverse pit below anterior ocellus; clypeus slightly elevated along basal margin, its apical margin truncate, slightly arched, and not notched; temple slightly wider than eye in dorsal view; malar furrow about half as long as basal width of mandible; galea much shorter than long axis of eye. Posterior portion of lateral face of pronotum weakly rugose; median lobe of mesoscutum with a shallow longitudinal depression each side of the median line; notaulices narrow, finely foveolate; upper groove of mesopleuron foveolate, its lower groove weakly foveolate, metapleuron rugose, except lower part of anterior portion which is smooth; propodeum finely rugose, its carinae, except pleural carinae, low and very indistinct. First abscissae of radius and basal vein about equal; third and fourth abscissae of cubitus about equal; recurrent vein and second abscissa of cubitus about equal; nervulus postfurcal by 0.80 its own length; first and second abscissae of submedius about equal; interanal vein represented by a short stub continued as a pigmented line. Second and fifth segments of fore tarsus about equal; apex of hind tibia thickened on outer margin and expanded into a flaring process; inner spur of middle tibia slightly less than 0.67 as long as basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia about half as long as basitarsus, basitarsus about as long as the next three segments combined, second tarsal segment longer than the fifth; hind claws pectinate basally. Second tergite shorter than the third medially; hypopygium large but not surpassing last tergite, about as long as first three tergites combined; ovipositor sheath thinly pubescent, about as long as the hypopygium (pl. 5, fig. 22).

Male.—Essentially similar to the female except that the abdomen is more extensively marked with black and the femora are more or less blackish basally.

Type.—U.S.N.M. No. 58286.

Type locality.—Yermo, Calif. (April 28, 1937, M. Cazier).

Described from the type, four males, Roseville, Calif., swept from grass, April 10, 1931, C. C. Wilson, and one male and one female from Los Angeles, Calif.

CARDIOCHILES EXPLORATOR (Say)

Bracon (*Toxoneuron*) *explorator* SAY, Boston Journ. Nat. Hist., vol. 1, pt. 3, p. 259, 1836 (female, male); in LeConte, Complete writings of Thomas Say on the entomology of North America, vol. 2, p. 710, 1859.

Toxoneuron explorator CRESSON, Can. Ent., vol. 5, p. 67, 1873.

Toxoneura explorator ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, pp. 49, 50, 1894.

Cardiochiles explorator VIERECK, Trans. Kans. Acad. Sci., vol. 19, p. 288, 1905.

Female.—Length about 4.0 mm. Black; middle part of mandible brownish yellow; wings light to dark fuliginous; femora ferruginous, fore and middle femora black basally; tibiae and spurs ferruginous, middle and hind tibiae dark apically; fore and middle tarsi dusky, hind tarsus black; ovipositor sheath black. Antenna 30-segmented; first flagellar segment longer than second, the second and third about equal; eye hairy; ocelli elevated; vertex smooth, polished; frons smooth, polished, face about twice as wide as long, smooth, polished; clypeus polished, its apical margin distinctly notched; temple slightly wider than eye in dorsal view; galea short. Lateral face of pronotum smooth and shining; mesoscutum smooth and shining; notaulices narrow, very finely foveolate, meeting in an acute angle and extending nearly to the transverse fossa; mesopleuron smooth and polished, upper groove broad and finely foveolate, lower groove usually smooth, posterior groove rather coarsely foveolate, metapleuron rugose on posterior section, smooth and shining on triangular anterior section; propodeum rugose, the carinae rather prominent and the areas usually well defined, spiracle ovate. First abscissae of radius and basal vein subequal; third abscissa of cubitus about half as long as fourth; recurrent vein slightly longer than second abscissa of cubitus; nervulus postfurcal by a little more than half its length; first abscissa of submedius slightly shorter than second; interanal vein represented as a pigmented line. Apex of hind tibia not thickened into a flaring process; inner spur of middle tibia about 0.80 as long as basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia about 0.67 as long as basitarsus, basitarsus slightly shorter than the next three tarsal segments combined, second tarsal segment longer than fifth, third and fifth segments about equal; hind claws pectinate. Second tergite shorter than third; hypopygium not surpassing last tergite; ovipositor sheath about as long as first three tergites combined, narrow basally, broadened apically, its tip slightly bent downward (pl. 5, fig. 15).

Male.—Essentially similar to the female.

Type.—Lost.

The material studied includes specimens from Indiana, Illinois, Kansas, Missouri, Colorado, Ohio, Texas, New Mexico, and Arizona. One specimen is labeled as having been reared from the garden web-

worm, *Loxostege similalis* (Guenee). Published records citing *Gnorimoschema operculella* (Zeller) as host presumably apply to the closely similar new species, *in sculptus*.

CARDIOCHILES FLORIDANUS (Ashmead), new combination

Toroneura floridana ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, pp. 49, 50, 1894 (male).

Toxoneuron floridanum PATTON, Psyche, vol. 7, p. 179, 1894.

Female.—Length about 6 mm. Black; middle part of mandible ferruginous; wings fuliginous, veins dark; coxae and trochanters black; femora ferruginous, fore and middle femora black basally; fore and middle tibiae ferruginous, apex of the latter black, hind tibia black, its basal 0.67 dark ferruginous ventrally; fore tibial spur ferruginous, spurs of middle and hind tibiae black; tarsi black, the four basal segments of fore tarsus dark ferruginous. Antenna of type incomplete; eye conspicuously hairy; ocelli elevated; vertex smooth, polished; frons smooth, polished, with a weak median longitudinal carina; face slightly less than twice as wide as long, smooth; clypeus flat, smooth, its apical margin notched medially, clypeal furrow weak; temple slightly wider than the eye in dorsal view; galea short. Median portion of lateral face of pronotum rugose; mesonotum smooth; notaulices narrow, sharp, finely foveolate; mesopleuron polished, upper groove widened and partitioned, lower groove foveolate, posterior groove coarsely foveate, with a smooth shallow groove at the middle leading anteriorly to the lower groove; metapleuron rugose, its anterior portion mostly smooth and polished; propodeum rugose, carinae distinct and high, spiracular area long, spiracle long ovate. First abscissa of radius slightly longer than that of basal vein; third abscissa of cubitus much shorter than fourth; recurrent vein and second abscissa of cubitus about equal; nervulus postfurcal by slightly more than half its length; first abscissa of submedius shorter than second; interanal vein represented by a pigmented line. Second and fifth segments of fore tarsus about equal; hind tibia not expanded into a flaring process; inner spur of middle tarsus about as long as basitarsus; inner spur of hind tarsus about 0.67 as long as basitarsus; basitarsus of hind leg about equal to the next three tarsal segments combined, third tarsal segment longer than fifth. Second tergite shorter than third medially; hypopygium plowshare-shaped, not or barely surpassing last tergite. Ovipositor sheath pubescent, broadened apically, and about as long as first three abdominal tergites combined (pl. 5, fig. 30).

Male.—Essentially similar to the female but with middle and hind tibiae almost entirely black.

Type.—U.S.N.M. No. 50155.

Specimens examined, in addition to the type, which is from Jacksonville, Fla., include a male reared at Manhattan, Kans., May, 1940.

from *Epipaschia zelleri* Grote: an unlabeled female; a female from Albany, Ga., April 20, 1938, P. W. Fattig; a male from Ontario, Canada, June, R. C. Osburn; and a male from Guadalajara, Mexico, August 2, 1913.

CARDIOCHILES INSCULPTUS, new species

Female.—Length about 3 mm. Black; middle part of mandible dark red; foreleg yellowish brown, coxa, trochanter, and basal half of femur black, last three tarsal segments blackish; middle leg yellowish brown, coxa, trochanter and basal part of femur black, apical half of basitarsus and all of the following tarsal segments blackish; hind leg yellowish brown, coxa and trochanter black, apex of tibia and tarsus blackish. Antennae of specimens in type series incomplete; first flagellar segment and scape about equal; eye closely hairy; ocelli elevated; vertex smooth, polished; frons smooth, polished, and with a weak median longitudinal carina; face about twice as wide as long, smooth, polished, with a short median ridge above; clypeus smooth, polished, and with apical margin notched medially; temple slightly broader than the eye; galea short. Lateral face of pronotum striate medially on its anterior half; notaulices finely foveolate, meeting in a rather broad angle; mesopleuron smooth, polished, upper groove foveolate, lower groove completely, finely foveolate, posterior groove foveolate, with a smooth groove from the middle leading to the lower groove; metapleuron rugose on posterior section, smooth and polished on anterior section; propodeum rugose, areola and spiracular areas delimited, costulae obsolete. First abscissa of radius longer and thicker than that of basal vein; fourth abscissa of cubitus 1.50 times as long as third; recurrent vein slightly shorter than second abscissa of cubitus; nervulus postfurcal by about half its own length; interanal vein represented by a pigmented line. Hind tibia not thickened apically and without a flaring process; inner spur of middle tibia about 0.75 as long as basitarsus, second and fifth tarsal segments equal; inner spur of hind tibia about 0.67 as long as basitarsus, basitarsus shorter than the next three tarsal segments combined, second tarsal segment longer than the fifth, third and fifth segments about equal; hind tarsal claws pectinate. First abdominal suture extending obliquely forward to the margin; second tergite slightly shorter than third; hypopygium not extending as far as apex of last tergite, about as long as the first three tergites combined, in profile pointed, its median ventral line folded longitudinally. Ovipositor sheath spatulate, pubescent, about as long as the hypopygium (pl. 5, fig. 23).

Male.—Essentially similar to the female.

Type.—U.S.N.M. No. 58287.

Type locality.—Beaufort, N. C.

Described from two females and one male from the type locality labeled "with potato tuberworm, June 25, 1942, C. F. Stahl, TCA 817."

CARDIOCHILES LEVIS, new species

Female.—Length about 5 mm. Ferruginous except as follows: Antenna, eye, vertex, frons medially, face above, basal margin of clypeus, clypeal foveae, lower part of temple, proepisternum, lower part of mesopleuron, pectus, lateral margin of first abdominal tergite, part of second tergite, tip of abdomen, and ovipositor sheath black; wings fuliginous; coxae and trochanters black; fore and middle femora black basally; tibiae black apically; fore and middle tarsi blackish; hind tibiae black. Pubescence of head short, yellowish brown; antenna 27-segmented in type; eye bare; ocelli elevated; vertex smooth, polished; frons smooth, polished, impressed, with a low tubercle below anterior ocellus; face about three times as wide as long, smooth, polished, and without a short median ridge above; clypeus polished, its median basal portion slightly elevated, and its apical margin weakly notched medially; temple bulging, wider than eye in dorsal view; galea short. Lateral face of pronotum smooth; mesoscutum smooth and polished; notaulices fine, not foveolate; mesosulcus weak, not foveolate; mesopleuron smooth, polished, its upper and lower grooves smooth, not foveolate, posterior groove finely foveolate, with a smooth groove at the middle leading toward the lower groove; metapleuron smooth and shining; propodeum mostly smooth except for carinae defining the areas, spiracle short ovate. First abscissae of radius and basal vein long and about equal; fourth abscissa of cubitus about twice as long as third; second abscissa of cubitus slightly longer than recurrent vein; nervulus postfurcal by about half of its length; first abscissa of submedius shorter than second; interanal vein represented by a short stump continued as a pigmented line. Fifth segment of fore tarsus longer than second; apex of hind tibia not expanded into a flaring process; inner spur of middle tibia about 0.67 as long as the basitarsus, second tarsal segment shorter than fifth; inner spur of hind tibia about 0.67 as long as basitarsus, basitarsus shorter than the last four tarsal segments combined, second and fifth tarsal segments about equal; hind tarsal claws pectinate basally. First abdominal suture extending obliquely forward to the margin; second and third tergites about equal medially; hypopygium very large, about as long as the first five tergites combined but not surpassing last tergite; ovipositor sheath pubescent, broad at base, narrowing apically, slightly curved downward, the exposed part little shorter than the hypopygium (pl. 5, fig. 31).

Male.—Essentially similar to the female except that head is mostly black, and black markings on thorax, abdomen, and legs are more extensive.

Type.—In the Academy of Natural Sciences of Philadelphia.

Type locality.—Pecos, N. Mex. (June 23).

Described from two females and a male. The allotype and paratype are in the U. S. National Museum; the female is from Juárez, Mexico, and the male from Albuquerque, N. Mex., both collected by T. D. A. Cockerell.

CARDIOCHILES MAGNUS, new species

Female.—Length about 8 mm. Head and thorax black with the following parts ferruginous: Narrow inner and broad outer orbits; median basal part of clypeus; mesoscutum and scutellum; upper portion of mesopleuron. Middle portion of lateral face of pronotum dark reddish. Wings fuliginous; costa and stigma dark. Coxae and trochanters black; femora ferruginous, black basally; tibiae ferruginous, hind tibia black at apex; tibial spurs testaceous. Abdomen ferruginous, its tip and hypopygium except base, black. Head elliptical in front view; antenna around 33-segmented; eye bare; ocelli elevated; vertex smooth, polished; frons smooth, polished; face about 2.50 as wide as long, punctate, and with a short median longitudinal ridge above, below which it is broadly a little elevated; clypeus punctate, its median basal portion slightly elevated, its apical margin truncate, not notched; temple bulging, wider than eye in dorsal view; malar furrow about 0.67 as long as basal width of mandible; galea much shorter than long axis of eye. Median portion of lateral face of pronotum rugose; mesoscutum and scutellum smooth and shining; median lobe of mesoscutum with a shallow longitudinal depression on each side of median line; notaulices foveolate; mesopleuron minutely punctate, upper groove foveolate, lower groove coarsely foveate; anterior triangular portion of metapleuron smooth, posterior portion rugulose; propodeum rugose, the carinae prominent, spiracle long ovate. First abscissa of radius longer than that of basal vein; third and fourth abscissae of cubitus about equal; recurrent vein and second abscissa of cubitus about equal; nervulus postfural by somewhat less than its length; first abscissa of submedius shorter than second; interanal vein represented by a short stump continued as a pigmented line. Second and fifth segments of fore tarsus about equal; inner spur of middle tibia about half as long as basitarsus, second and fifth tarsal segments about equal; apex of hind tibia thickened on outer margin and expanded into a flaring process, inner tibial spur less than half as long as basitarsus, basitarsus shorter than remaining tarsal segments combined, second segment longer than fifth; hind tarsal claws pectinate, each with four or five short teeth on basal half. First abdominal suture slightly curved to the margin; second tergite shorter than third, hypopygium plowshare-shaped, very large, surpassing apex of last tergite, about as long as the first five tergites combined; ovipositor sheath longer than hind tibia, broadest at the

middle, smooth, polished, and sparsely pubescent on apical half (pl. 5, fig. 14).

Male.—Essentially similar to the female.

Type.—U.S.N.M. No. 58289.

Type locality.—Plainview, Jefferson County, Colo. (July 1922).

Described from the type and the following eight female and three male paratypes: Male, Platte County, Colo., August 7; female, Plainview, Jefferson County, Colo., July 1922; male and two females, Mexia, Tex., September 13, 1905, parasite of *Schinia* sp. (Phalaenidae); male, Clarendon, Tex., September 19, 1905; female, Garden City, Kans., September 1896, W. H. Menke; male, Wellington, Kans., E. G. Kelly; female, Albuquerque, N. Mex.; and two female paratypes of *Cardiochiles seminigrum* (Cresson) from Colorado. The two last paratypes are in the Academy of Natural Sciences of Philadelphia; the others are in the U. S. National Museum.

CARDIOCHILES MINUTUS (Cresson), new combination

Toxoneuron minutum CRESSON, Can. Ent., vol. 5, p. 67, 1873 (female).

Toxoneura minuta ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, p. 49, No. 2, 1894 (female).

Female.—Length 2.50 mm.. Black, apical part of pedicel dark ferruginous; wings fuliginous; foreleg black, femur apically, tibia, and first four tarsal segments yellowish white; middle leg black, femur apically and first four tarsal segments yellowish white, tibia blackish; hind leg black, tibia and tarsus blackish, tibial spur yellowish white; lateral part of first tergite and anteroventral corner of second tergite chestnut brown. Antenna 23-segmented, pedicel about 0.40 as long as the first flagellar segment; eye hairy; ocelli elevated; vertex striate, frons impressed, transversely striate, and with a median longitudinal carina; face about twice as wide as long, irregularly punctate, and with an indistinct tubercle above; clypeus somewhat wrinkled, its apical margin distinctly notched; temple slightly wider than the eye in dorsal view; occiput roughened; galea short. Median portion of lateral face of pronotum and the mesonotum irregularly punctate; notaulices sharply impressed, finely foveolate; upper groove of mesopleuron widened and rugose, lower groove foveolate, posterior groove coarsely foveate with a smooth depression at the middle leading to the lower groove; metapleuron rugose, the small anterior portion smooth and polished; propodeum rugose, carinae moderately prominent and the areas distinctly delimited, spiracle short ovate. Wings iridescent; first abscissa of radius and basal vein about equal; fourth abscissa of cubitus about 1.50–2.0 times as long as the third; recurrent vein and the second abscissa of cubitus about equal; nervulus postfurcal by half its own length; first abscissa of submedius slightly longer than the

second; interanal vein absent or represented by a pigmented line. Second and fifth segments of fore tarsus about equal, apex of hind tibia not thickened or expanded into a flaring process; inner spur of middle tibia about as long as basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia about half as long as basitarsus, basitarsus shorter than remaining tarsal segments combined, second tarsal segment longer than fifth. First abdominal suture extending obliquely forward to the margin; second tergite shorter than third; hypopygium pointed in profile, and about as long as first two abdominal tergites combined; its median ventral line without a longitudinal fold; ovipositor sheath pubescent, its exposed part slightly less than the first three tergites combined (pl. 5, fig. 27).

Described from the type.

Male.—Essentially similar to the female.

Type.—In the Academy of Natural Sciences of Philadelphia.

In addition to the type, which is from Illinois, about 25 specimens have been examined. These are from localities in Virginia, Iowa, Tennessee, and Ontario, Canada.

CARDIOCHILES NEBRASCENSIS, new species

Female.—Length, about 6 mm. Head and thorax black, narrow inner and broad outer orbital markings and basal median part of clypeus yellowish brown; pedicel apically, middle part of mandibles and lateral face of pronotum medially, deep ferruginous; mesoscutum with a small yellowish brown spot inside each posterolateral corner. Wings fuliginous, stigma and costa blackish, the costa light brown basally; legs ferruginous, with fore and middle coxae and trochanters black, the last two tarsal segments of fore and middle legs fuscous; hind coxa with a small black spot on outer side, hind tibia infuscated at extreme apex and hind tarsus black. Abdomen entirely ferruginous; ovipositor sheath black, ferruginous basoventrally. Antenna incomplete; eye bare; ocelli elevated; vertex smooth, polished; frons smooth, polished, and with a median longitudinal carina; face about 2.50 times as wide as long, punctate, and with a median tubercle above, below which a groove extends to the clypeus between two slightly raised areas; clypeus with a median elevation basally, its apical margin not notched; temple wider than the eye in dorsal view; galea at least 0.80 as long as the long axis of the eye, rounded apically. Median lobe of mesoscutum depressed medially; notaulices foveolate, coarsely so posteriorly; mesopleuron finely punctate, upper groove of mesopleuron widened and partitioned, lower groove foveolate, posterior groove coarsely foveate; metapleuron rugose, the small anterior triangular section smooth, with only minute, scattered punctures; propodeum rugose, areola and spiracular areas defined by prominent

carinae, costulae weak or indistinct, spiracle long ovate. Forewings incomplete, third abscissa of cubitus longer than the fourth; nervulus postfurcal by about half its own length; interanal vein represented by a short stump continued as a pigmented line. Fifth segment of fore tarsus longer than second; apex of hind tibia thickened on outer dorsal margin and expanded into a strongly flaring process; inner spur of middle tibia about 0.60 as long as basitarsus, second tarsal segment shorter than fifth; inner spur of hind tibia about half as long as basitarsus, basitarsus shorter than the last four tarsal segments combined, second tarsal segment longer than fifth. First abdominal suture slightly curved to the margin. Second tergite very slightly shorter than third medially; hypopygium a little longer than the first two tergites combined, its median ventral line without a longitudinal fold; ovipositor sheath smooth, polished, spatulate, its exposed part slightly shorter than the hypopygium (pl. 5, fig. 17).

Type.—U.S.N.M. No. 58290.

Type locality.—Nebraska.

Described from a single female specimen collected by T. Pergande.

CARDIOCHILES NIGRICANS, new species

Male.—Length 5.5 mm. Intensely black, foretibial spur brownish yellow; forewing with apical 0.40 fuliginous, the rest hyaline, and hind wing with about apical third fuliginous. Head covered with thick, unusually black hair; antenna 48-segmented; eye bare; ocelli elevated; vertex smooth and polished; frons impressed, and with a weak median longitudinal elevation; face polished, flat, more than three times as wide as long, with a low median tubercle above; clypeus polished, about 2.50 times as wide as long, the median apical margin not notched; temple and eye subequal in width in dorsal view; galea short. Median portion of lateral face of pronotum rugose; median lobe of mesoscutum with a shallow depression on each side of median line; notaulices sharp, finely foveolate; mesopleuron polished, with scattered, minute punctures; upper groove foveolate; lower groove weakly foveolate, posterior groove finely foveolate; metapleuron rugose, a flat, polished area on its anterior portion; propodeum rugose, carinae, including costulae, prominent, areola smaller than spiracular area, spiracle ovate. First abscissa of radius longer than that of basal vein; third abscissa of cubitus slightly shorter than fourth; second abscissa of cubitus longer than recurrent vein; nervulus postfurcal by 0.67 its own length; first abscissa of submedius slightly shorter than second; interanal vein represented by a short pigmented stump. Fore femur fringed with long pubescence ventrally, fifth segment of fore tarsus longer than second; hind tibia somewhat compressed and broadened toward apex, but without an apical thickening, and not expanded

into a flaring process; inner spur of middle tibia about 0.75 as long as its basitarsus, second tarsal segment slightly shorter than fifth; inner spur of hind tibia about 0.67 as long as its basitarsus, basitarsus about as long as the next three tarsal segments combined, second tarsal segment slightly shorter than fifth; hind tarsal claws pectinate, each with five short, visible teeth basally. First abdominal suture slightly curved to the margin; second tergite much shorter than third medially.

Type.—U.S.N.M. No. 58291.

Type locality.—Jacumba, Calif.

Described from a single male collected by D. J. and J. N. Knull, May 18, 1941.

CARDIOCHILES NIGRICEPS Viereck

Cardiochiles nigriceps VIERECK, Proc. U. S. Nat. Mus., vol. 43, p. 578, 1912 (female, male).—CHAMBERLIN and TENHET, Jour. Agr. Res., vol. 33, p. 21, 1926.

Toxoneuron sp. MORGAN and McDONOUGH, U. S. Dept. Agr. Farmers' Bull. 819, p. 6, 1917.

When he described this species Viereck suggested that it might prove to be only a race of *viator* or *seminiger*. It is quite distinct from *viator*, differing in the much shorter galea and labium, in the dark costa and stigma, and in not having apex of hind tibia expanded into a strongly flaring process. Essentially it is very similar to *seminiger* (Cresson) and perhaps is only subspecifically distinct, but for the present at least it seems advisable to give it specific rank. It may be separated from *seminiger* by the following color differences: Pronotum black, median part of lateral face sometimes red or yellowish brown; anterior part of mesoscutum, or at least anterior part of median lobe, black; fore and middle femora largely black or piceous. The middle lobe of the mesoscutum slopes more gradually to the pronotum than in *seminiger* (pl. 4, figs. 6, 7), and the first intercubitus is angulate and often appendiculate below the middle.

Type.—U.S.N.M. No. 15007.

In addition to the type series from Georgia and Florida, the author has examined specimens from South Carolina, Georgia, Florida, Virginia, District of Columbia, Alabama, Mississippi, Louisiana, Arkansas, and Colorado. The species is commonly reared as a parasite of the tobacco budworm, *Heliothis virescens* (Fabricius).

CARDIOCHILES NIGROCLYPEUS Viereck

Cardiochiles nigroclypeus VIERECK, Trans. Kans. Acad. Sci., vol. 19, p. 275, 1905 (male).

Male.—Length 6.5 mm. Head and thorax black. Wings entirely dark fuliginous; legs ferruginous, coxae, trochanters, fore and middle femora basally, apex of hind tibia, and tarsi black, tibial spurs dark, except spur of foreleg which is ferruginous; abdomen ferruginous;

external genitalia black. Pubescence chestnut brown. Antenna 45-segmented, eye bare, ocelli elevated, vertex smooth, polished; frons transversely striate, and with a median longitudinal elevation; face slightly less than three times as wide as long, smooth, polished, slightly convex, and with a minute, median tubercle above, clypeus smooth, polished, its median apical margin slightly flaring, not notched; temple and eye of about equal width; occiput aciculate; galea short. Median portion of lateral face of pronotum rugose; median lobe of mesoscutum without a distinct longitudinal depression on each side of median line; notaulices finely foveolate; scutellum sculptured apically; mesopleuron strongly punctate or ruguloso-punctate, upper groove wide and coarsely rugulose; lower groove foveolate, posterior groove finely foveolate; metapleuron rugose, with a triangular, smooth and shining area on anterior portion; propodeum rugose, its carinae including costulae moderately high, areola smaller than the spiracular area, spiracle ovate. First abscissa of radius longer than that of basal vein; third abscissa of cubitus shorter than fourth; recurrent vein and second abscissa of cubitus about equal; nervulus postfurcal by half of its own length; first abscissa of submedius slightly longer than second; interanal vein represented by a pigmented line, second and fifth segments of fore tarsus about equal; hind tibia without apical thickening or a flaring process; inner spur of middle tibia about 0.60 as long as the basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia about 0.60 as long as basitarsus, basitarsus slightly shorter than the last three tarsal segments combined, second and third tarsal segments longer than fifth; hind tarsal claws pectinate, each with seven short teeth basally. First abdominal suture slightly curved to the margin; second abdominal tergite shorter than the third.

Type.—In the University of Kansas.

In addition to the male type, from Morton County, Kans., the writer has seen three male specimens simply labeled "Texas."

CARDIOCHILES ORIZABAE (Cresson), new combination

Toxoneuron orizabae CRESSON, Can. Ent., vol. 5, pp. 66, 67, 1873 (male).

Male.—Length 4.2 mm. Black; legs black, with foreleg more or less yellowish brown beyond base of femur, and knee of middle leg yellowish brown; wings light fuliginous. Antenna 30-segmented; eye hairy; ocelli slightly elevated; vertex about as long as the frons, smooth, shining; frons smooth, shining, and with an incomplete, low, median longitudinal carina; face less than one and one-half times as wide as long, smooth, shining, with a small median tubercle above; clypeus smooth, shining, its apical margin notched medially; temple

and eye of about equal width in dorsal view; galea short. Lateral face of pronotum wrinkled medially on anterior half; mesonotum smooth and polished; notaulices fine, indistinctly foveolate; mesopleuron smooth and shining, upper groove broad, rugulose, irregularly partitioned, lower groove weakly foveolate, posterior groove strongly foveate with a delicate curved groove from its middle leading to the lower groove; metapleuron rugose, a large, smooth and polished area anteriorly; propodeum rugose, its carinae, including costulae, prominent, spiracle ovate. First abscissa of radius longer and thicker than that of basal vein; fourth abscissa of cubitus about 1.50 times as long as the third; second abscissa of cubitus and recurrent vein about equal; interanal vein represented by a pigmented line. Second and fifth segments of fore tarsus about equal; inner tibial spur of middle leg very nearly as long as basitarsus, second tarsal segment longer than fifth, third and fifth segments about equal; apex of hind tibia not broadened, inner tibial spur about two-thirds as long as the basitarsus, basitarsus about as long as the next three tarsal segments combined, second tarsal segment longer than third, third longer than fifth; hind tarsal claws pectinate basally. First abdominal suture extending obliquely forward laterally; third tergite slightly over 1.50 times as long as second. (Redescribed from the male type.)

Female.—Essentially similar to the male. Hypopygium about as long as hind basitarsus, plowshare-shaped, not surpassing apex of last tergite; ovipositor sheath about as long as the first three segments of hind tarsus combined and pubescent (pl. 5, fig. 34).

Type.—In the Academy of Natural Sciences of Philadelphia.

In addition to the type from Orizaba, Mexico, numerous specimens, collected at localities in Georgia, Alabama, Florida, Arkansas, Kansas, Louisiana, Texas, and Mexico have been studied.

***CARDIOCHILES PLUTO* (Ashmead), new combination**

Toxoncurea pluto ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, No. 1, pp. 48, 49, 1894 (female).

Male.—Length about 7 mm. Black; apical end of pedicel, outer orbit, basal part of clypeus, middle part of mandible weakly suffused with red; wings fuliginous; genitalia black. Head with long black hair that is shorter, however, than in *nigricans*; antennae incomplete; eye bare; ocelli elevated; vertex smooth, polished; frons smooth and polished; face about 2.50 times as wide as long, smooth, polished, and with a short median ridge above; clypeus smooth, polished, its apical margin slightly flaring medially, not notched; temple wider than eye in dorsal view; galea short. Posterior portion, except broad margins, of lateral face of pronotum rugose; mesoscutum without a longitudinal depression along each side of the median line; notaulices narrow, finely

foveolate; mesopleuron polished, its upper groove widened, and coarsely partitioned, lower groove finely foveolate, posterior groove coarsely foveate; metapleuron rugose, anterior triangular portion mostly smooth; propodeum rugose, carinae rather prominent, the areas well defined, costulae distinct, spiracle ovate. First abscissa of radius longer than that of basal vein; third and fourth abscissae of cubitus about equal; recurrent vein slightly longer than the second abscissa of cubitus; nervulus postfurcal by half its length; first and second abscissae of submedius about equal; interanal vein represented by a short stump continued by a pigmented line. Forefemur fringed with long pubescence ventrally; hind tibia broadened at apex but not expanded into a flaring process; inner spur of middle tibia a little more than half as long as the basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia slightly more than half as long as basitarsus, basitarsus about as long as the next three tarsal segments combined, second tarsal segment longer than fifth; hind tarsal claws pectinate. First abdominal suture slightly curved to the margin; second tergite shorter than third medially.

Type.—U.S.N.M. No. 2170.

Redescribed from the type, from Los Angeles, Calif., and a paratype male, San Bernardino County, Calif., the only known specimens.

CARDIOCHILES RUBICUNDUS, new species

Female.—Length 5.5 mm. Ferruginous; antenna, eye, tips of mandibles and ocellar area black; wings fuliginous, costa and stigma ferruginous; antennae black, anterior surface and basal part of posterior surface of scape ferruginous; ovipositor sheath dark ferruginous. Pubescence of head very short, golden; antenna 33-segmented; eye bare; ocelli elevated; vertex smooth and polished; frons smooth, polished, impressed, slightly elevated down the middle; face about 2.25 times as wide as long, convex, punctate, with a median longitudinal ridge above, below which it is a little elevated; clypeus punctate, slightly elevated along basal margin, apical margin truncate, a little flaring, not notched; temple wider than the eye in dorsal view; malar furrow about 0.67 as long as basal width of mandible; galea moderate, but considerably shorter than long axis of eye. Lateral face of pronotum smooth and shining except in the median longitudinal groove, median lobe of mesoscutum with an indistinct median longitudinal elevation; notaulices foveolate; mesopleuron polished, its upper groove coarsely foveolate, its lower groove straight, foveolate, posterior groove foveate; metapleuron mostly smooth; propodeum rugose, carinae moderately high, costulae distinct, spiracle long ovate. First abscissa of radius longer than that of basal vein; third abscissa of cubitus slightly longer than fourth; recurrent vein longer than second

abscissa of cubitus; nervulus postfurcal by 0.67 its length; first abscissa of submedius slightly shorter than second; interanal vein represented by a short stump continued by a pigmented line. Fifth segment of fore tarsus longer than second; hind tibia flattened and broadened toward apex, its outer apical margin thickened and expanded into a flaring process; hind femur broad, nearly half as wide as long; inner spur of middle tibia about 0.75 as long as its basitarsus; inner spur of hind tibia slightly less than 0.67 as long as basitarsus; second segment of middle leg shorter than fifth; basitarsus of hind leg shorter than the remaining four tarsal segments combined; second and fifth segments of hind tarsus about equal; hind tarsal claws pectinate, each with five short visible teeth basally. First abdominal suture slightly curved to the margin; second tergite shorter than third medially; hypopygium in profile obtuse at apex, about as long as second and third tergites combined, its median ventral line without a longitudinal fold; ovipositor sheath more than half as long as hypopygium and a little shorter than hind basitarsus (pl. 5, fig. 32).

Type.—U.S.N.M. No. 58292.

Type locality.—Las Cruces, N. Mex.

Described from a single female collected by T. D. A. Cockerell.

CARDIOCHILES RUBIDUS, new species

Female.—Length 7.5 mm. Ferruginous; antenna, eye, vertex and frons medially, mesosternum, propodeum, posterior portion of metapleuron, and ovipositor sheath black; wing fuliginous; costa and stigma ferruginous; hind tarsus fuscous; pubescence of head golden brown. Antennae incomplete; eye bare; ocelli elevated; vertex and frons smooth and polished; face about 2.50 times as wide as long, smooth and shining, with a low median tubercle above; clypeus smooth, its basal half slightly elevated medially, its apical margin truncate, not notched; temple slightly narrower than eye in dorsal view; galea very short. Central portion of lateral face of pronotum weakly sculptured; median lobe of mesoscutum with a shallow longitudinal depression on each side of median line; notaulices moderately foveolate; mesopleuron smooth, upper groove foveolate and widened posteriorly, lower groove with more or less elliptical foveae, posterior groove foveate; metapleuron with posterior portion rugulose and anterior portion smooth; propodeum rugose, areolar carinae low, costulae weak, areola broader than spiracular area, spiracular area acute posteriorly, spiracle long ovate. First abscissae of radius and basal vein equal; third abscissa of cubitus shorter than fourth; recurrent vein slightly longer than second abscissa of cubitus; nervulus postfurcal by slightly over 0.67 its length; first abscissa of submedius shorter than second; interanal vein represented by a short stump continued by a pig-

mented line. Second and fifth segments of fore tarsus about equal; hind tibia somewhat thickened apically but not expanded into a flaring process; inner spur of middle tibia about 0.67 as long as basitarsus; inner spur of hind tibia slightly more than half as long as basitarsus; second and fifth segments of middle tarsus about equal; second and fifth segments of hind tarsus about equal; basitarsus of hind legs slightly flattened, about as long as the next three segments combined; hind tarsal claws pectinate, each with three or four teeth on basal half. First abdominal suture slightly curved to the margin, second tergite shorter than third medially; hypopygium in profile obtuse, about as long as second and third tarsal segments of hind leg combined, its median ventral line without a longitudinal fold. Ovipositor sheath short, pubescent, its exposed part about one-third the length of hypopygium (pl. 5, fig. 25).

Type.—U.S.N.M. 58293.

Type locality.—Six miles west of Lakeview, Oreg., 5,100 feet.

Described from two females; the type is labeled as collected July 8, 1937, by Bolinger and Jewett; the paratype bears only the label "Ariz."

CARDIOCHILES RUFOSTIGMA, new species

Female.—Length 7 mm. Head, thorax, and abdomen black with the following parts reddish yellow: Narrow inner and broad outer orbits; lateral lobes of mesoscutum posteriorly; and basal half of abdomen except first and second tergites medially. Antenna black. Wings fuliginous, base of costa, stigma except apex, and base of subcostella reddish yellow. Coxae and trochanters black. Femora reddish yellow, darkened outwardly at their bases. Tibiae and their spurs testaceous, hind tibia black at apex. Tarsi black, the basal three and a half segments of the fore tarsus and the basal half of the first segment of the middle tarsus pale. Ovipositor sheath black. Pubescence of head rather long, chestnut brown in color; antennae incomplete; eye bare; ocelli slightly elevated; vertex smooth and polished; frons smooth and polished; face about 3.0 as wide as long, finely punctate, with a short median longitudinal ridge above; clypeus punctate, the punctures a little coarser than those of the face, basal portion slightly elevated, apical margin truncate, not notched; temple wider than eye in dorsal view; galea very short. Central portion of lateral face of pronotum rugose; median lobe of mesoscutum with a weak longitudinal depression each side of median line; notaulices moderately foveolate; mesopleuron punctate, its upper groove foveate and widened posteriorly, lower groove foveolate, posterior groove foveate; metapleuron rugose except on the anterior portion; propodeum rugose, carinae moderately prominent, costulae present, spiracular area about as large as areola, spiracle long ovate. First abscissa

of radius slightly shorter but thicker than that of basal vein; third abscissa of cubitus slightly shorter than fourth; recurrent vein longer than second abscissa of cubitus; nervulus postfurcal by 0.67 its length; first abscissa of submedius shorter than second; interanal vein represented by a short stump continued by a pigmented line, second and fifth segments of fore tarsus about equal; apex of hind tibia thickened on outer margin at apex and expanded into a flaring process; inner spur of middle tibia about 0.67 as long as basitarsus; inner spur of hind tibia about half as long as basitarsus; second and fifth segments of middle tarsus about equal; second segment of hind tarsus longer than fifth; hind tarsal claws pectinate basally, each with three or four visible teeth. First abdominal suture slightly curved to the margin, second and third tergites about equal medially; hypopygium in profile obtuse, about as long as combined length of first two tergites, its median ventral line without a longitudinal fold; ovipositor sheath about 0.67 as long as hypopygium, smooth, polished, spatulate, with short pubescence (pl. 5, fig. 37).

Male.—Similar to the female except slightly smaller, mesoscutum entirely black, hind femur and tibia wholly ferruginous, fore and middle tarsi pale.

Type.—U.S.N.M. No. 58294.

Type locality.—Fairfax, Calif. (May 1, 1921, C. T. Dodds).

Described from two females and two males; the paratypes are merely labeled "So. Cal." Two paratypes are in the Academy of Natural Sciences of Philadelphia.

CARDIOCHILES SEMINIGER (Cresson)

Tenthredoides seminiger CRESSON, Proc. Ent. Soc. Philadelphia, vol. 4, p. 291, 1865 (female, male).

Toxoncureon seminigrum CRESSON, Trans. Amer. Ent. Soc., vol. 4, p. 179, 1872.—CAMERON, Biologia Centrali-Americana, Hymenoptera, vol. 1, p. 411, No. 5, 1887.

Toxoncurea seminigra ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, No. 10, pp. 49, 52, 1894.

Cardiochiles seminigrum VIERECK, Trans. Kansas Acad. Sci., vol. 19, p. 275, 1905.

Female.—Length about 7 mm. Head black, narrow inner and broad outer orbits and basal half of clypeus ferruginous; middle part of mandible dark red; thorax and abdomen ferruginous, proepisternum, anterior margin of the lateral face of pronotum, pectus, ventral half and posterior margin of mesopleuron, metapleuron, and propodeum, black; wings fuliginous, veins dark; legs ferruginous, coxae, trochanters, and femora basally, black; apex of hind tibia, last tarsal segment of foreleg and middle tarsus blackish, hind tarsus black; first tergite black medially; ovipositor sheath black. Antenna 39-segmented in the type, eye bare; ocelli elevated slightly; vertex smooth and polished; frons

smooth and polished; face about 2.50 times as wide as long, minutely punctate, with a low median tubercle above; clypeus slightly elevated along basal margin, apical margin not notched, and slightly arched outwardly; temple wider than eye in dorsal view; galea short. Posterior part of lateral face of pronotum rugose; median lobe of mesoscutum weakly elevated down the middle, the depression on each side of median line weak or indistinct; notaulices finely foveolate; upper and lower grooves of mesopleuron foveolate, posterior groove foveate, metapleuron rugose, except on the small anterior portion which is minutely, shallowly punctate; propodeum rugose, carinae moderately prominent, costulae present, areola rather narrow, spiracle ovate. First abscissa of radius longer than that of basal vein; third abscissa of cubitus slightly longer than fourth; nervulus postfurcal by about 0.67 its length; recurrent vein shorter than second abscissa of cubitus; first abscissa of submedius shorter than second; interanal vein represented by a short stump continued by a pigmented line. Second and fifth segments of fore tarsus about equal; hind tibia broadened at apex but not expanded into a flaring process; inner spur of middle tibia slightly over half as long as basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia about half as long as basitarsus, basitarsus flattened and shorter than the last four tarsal segments, second tarsal segment longer than fifth; hind tarsal claws pectinate basally. First abdominal suture slightly curved to the margin; second tergite shorter than third medially; hypopygium in profile acute at apex, about as long as the first two tergites combined, its median ventral line without a longitudinal fold; ovipositor sheath about 0.75 as long as hypopygium, longer than hind basitarsus, slightly pubescent, weakly decurved at apex (pl. 5, fig. 28).

Male.—Essentially like the female.

Type.—In the Academy of Natural Sciences of Philadelphia.

In addition to the type, which is from El Paso County, Colo., the author has studied specimens from Colorado, Kansas, Montana, Utah, New Mexico, Texas, Iowa, and Arizona.

CARDIOCHILES TENNESSENSIS, new species

Female.—Length 6 mm. Head and thorax black, with broad outer and incomplete, narrow inner orbital markings, and posterior half of mesonotum, ferruginous; lateral face of pronotum and metanotum also more or less ferruginous; wings dark fuliginous; coxae, trochanters, and fore and middle femora black; hind femur ferruginous; fore and middle tibiae and tarsi blackish, hind tibia ferruginous, broadly blackish apically, tibial spurs ferruginous; abdomen ferruginous; ovipositor sheath black. Pubescence of head not especially long or thick, chestnut-brown; antenna 36-segmented; eye bare; ocelli elevated;

vertex smooth and polished; frons smooth, polished, with a small, shallow pit below anterior ocellus, and with a low median longitudinal elevation; face about 2.50 times as wide as long, smooth, and with a median tubercle above; clypeus with longer pubescence than the face, median basal part convex, apical margin not notched; temple slightly wider than eye; galea short. Middle portion of lateral face of pronotum weakly ruguloso-punctate; median lobe of mesoscutum with a depression each side of the median line; notaulices finely foveolate; upper groove of mesopleuron wide, shallow, distinctly partitioned, lower groove weakly, finely foveolate; and posterior groove coarsely foveate; metapleuron ruguloso-punctate, triangular anterior portion plain, a deep pit on the margin between the anterior and posterior portions, and a deep, coarsely foveate groove along upper margin of posterior face; propodeum finely rugose, carinae delimiting areola low, costulae not defined, spiracle short ovate. First abscissae of radius and basal vein about equal; third abscissa of cubitus longer than fourth; first intercubitus sharply angulate and with a short stump of a vein from the angle; second abscissa of cubitus 1.50 times as long as recurrent vein; nervulus postfurcal by 0.67 its length; interanal vein absent. Second and fifth segments of fore tarsus about equal; hind tibia slightly curved, widened at apex, but not expanded into a strongly flaring process; the inner spur of middle tibia slightly more than half as long as basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia about half as long as basitarsus, basitarsus about as long as the last four tarsal segments combined, second tarsal segment longer than fifth; hind tarsal claws pectinate, each with four visible teeth basally. First abdominal suture slightly curved to the margin; second and third tergites of equal length medially; hypopygium about as long as third and fourth abdominal tergites combined, its median ventral line without a longitudinal fold; ovipositor sheath short, the exposed part about 0.25 as long as the hypopygium, smooth and polished (pl. 5, fig. 21).

Type.—U.S.N.M. No. 58295.

Type locality.—Clarksville, Tenn.

Described from a single female reared August 1909 "from budworm." Presumably the host was the tobacco budworm, *Heliothis virescens* (Fabricius).

Very similar to *nigriceps* Viereck, the common parasite of *Heliothis virescens*, but it may be distinguished from that species by the much less strongly sculptured metapleura and propodeum and by the relatively long second tergite.

CARDIODHILES TEXENSIS, new species

Female.—Length 7.5 mm. Head and thorax black, with narrow inner and broad outer orbital markings and spot on clypeus, ferrugi-

neous. Wings dark fuliginous, veins and stigma blackish. Legs ferruginous, their coxae and trochanters black and tarsi fuscous; abdomen ferruginous; ovipositor sheath black. Pubescence of head short and sparse. Antenna 37-segmented in type; eye bare; ocelli elevated; vertex and frons smooth and polished; face convex, punctate except medially, and with a median longitudinal ridge above extending down to the middle; clypeus punctate, elevated basally, apical margin truncate and not notched; temple narrower than the eye in dorsal view; galea very long, its exposed part longer than the long axis of the eye, tapering apically. Median lobe of mesoscutum nearly flat, without a depression on each side of the median line; notaulices moderately foveolate; mesopleuron smooth except for exceedingly minute setigerous punctures, upper groove unusually narrow, finely foveolate, lower groove finely foveolate anteriorly, coarsely so posteriorly, posterior groove coarsely foveate; metapleuron mostly smooth, rugose only on apical third of the large posterior section; propodeum rugose with prominent carinae defining the areas, areola diamond-shaped, costulae distinct, spiracular area not acute posteriorly, spiracle ovate. First abscissa of radius longer than that of basal vein; first intercubitus not angulate; third and fourth abscissae of cubitus about equal; second abscissa of cubitus longer than recurrent vein; nervulus postfural by about 0.80 its length; first abscissa of submedius shorter than the second; interanal vein represented by a short stump continued by a pigmented line. Fifth segment of foretarsus longer than the second; apex of hind tibia much thickened outwardly and expanded into a strongly flaring process; inner spur of middle tibia about 0.67 as long as basitarsus, second segment of middle tarsus shorter than fifth; inner spur of hind tibia about half as long as basitarsus, second and fifth tarsal segments about equal, basitarsus shorter than the last four tarsal segments combined; hind tarsal claw pectinate with three to four visible teeth basally. First abdominal suture slightly curved to the margin; third tergite longer than second medially; hypopygium very prominent, extending far beyond apex of last tergite, in profile acutely pointed, about as long as the first five tergites combined, its median ventral line without a longitudinal fold. Ovipositor sheath as long as hind tarsus, narrowing conspicuously from middle to apex, sparsely pubescent (pl. 5, fig. 16).

Type.—U.S.N.M. No. 58296.

Type locality.—Calvert, Tex.

Described from two females. The type was collected on *Heterotheca subaxillaris* by F. C. Bishopp in October; the paratype was taken at College Station, Tex., October 11, 1936.

Apparently related to *magnus* but is not so stout; it differs further in having the galea much longer, the temple much narrower, and the

hypopygium more produced; in color it differs especially in having the thorax black.

CARDIOCHILES THERBERIAE Rohwer

Cardiochiles therberiae ROHWER, Proc. U. S. Nat. Mus., vol. 57, pp. 226-227, 1920 (female).

Female.—Length 5.5 mm. Head black; incomplete orbital markings, lower part of face, clypeus, lower end of cheek, anterior surface of scape, and apical part of pedicel, brownish yellowish; thorax ferruginous; wings strongly fuliginous, costa and stigma brownish black; foreleg brownish yellow, with coxa, trochanter, and femur basally, black; middle leg black, apex of femur, basal two-thirds of tibia, and tarsus brownish yellow; hind leg black or blackish, tibia dark brown on basal half; spurs of fore and middle tibiae ferruginous, and of hind tibia dark ferruginous; abdomen black, its first and second tergites ferruginous medially. Antenna 33-segmented in type; eye hairy; ocelli elevated; vertex smooth, polished, and flat; frons smooth and polished, and with a low median longitudinal keel; face slightly less than twice as wide as long, smooth and shining; clypeus smooth, polished, its apical margin notched at the middle; temple slightly wider than eye in dorsal view; galea short. Median lower portion of lateral face of pronotum slightly wrinkled; median lobe of mesoscutum without a longitudinal depression each side of median line; notaulices sharply impressed, finely foveolate; mesopleuron smooth, polished, upper groove smooth, lower groove incompletely and weakly foveolate, posterior groove foveolate and with a distinct smooth groove from its middle to the lower groove; metapleuron smooth except ventroposterior corner of posterior portion which is rugose; propodeum rugose, the carinae prominent, areas sharply delimited. First abscissa of radius about 1.50 times as long as that of basal vein; third abscissa of cubitus slightly shorter than fourth; second abscissa of cubitus about 1.50 times as long as recurrent vein; recurrent vein about one-third as long as second abscissa of basal vein; nervulus postfurcal by about half of its length; first abscissa of submedius shorter than second; interanal vein represented by a pigmented line. Second segment of fore tarsus shorter than fifth; apex of hind tibia not expanded into a flaring process; inner spur of middle tibia longer than basitarsus; second and fifth segments of middle tarsus about equal; inner spur of hind tibia about 0.75 as long as basitarsus, basitarsus shorter than the last four tarsal segments combined, second tarsal segment slightly longer than fifth; hind tarsal claws pectinate. First abdominal suture extending obliquely forward laterally; second tergite shorter than third; hypopygium slightly shorter than first tergite, its median ventral line folded; ovipositor sheath about 0.33 as long as the abdomen and pubescent (pl. 5, fig. 39).

Male.—Essentially similar to the female except as follows: Length 4.5 mm.; cheek, temple, and face black; antenna 32-segmented; third abscissa of cubitus distinctly shorter than fourth.

This species is very close to *C. thoracicus* (Cresson).

Type.—U.S.N.M. No. 22033.

Redescribed from the type female and a paratype male, both from Sabino Basin, Santa Catalina Mountains, Ariz.; and one male from Victoria, Tex., September 18, 1913.

CARDIOCHILES THORACICUS (Cresson), new combination

Toxoneuron thoracicum CRESSON, Can. Ent., vol. 5, p. 68, 1873 (female).

Toxoneura thoracica ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, No. 8, pp. 49, 51, 1894 (female, male).

Female.—Length 4.5 mm. Head ferruginous, with antennae, cheeks below and lower part of face between cheek and clypeus black; eye grayish black; apical margin of clypeus dark ferruginous; thorax, abdomen, and legs black; pronotum, proepisternum, mesonotum, tegulae, upper part of mesopleuron, apical third of fore femur, and fore tibia and tarsus, ferruginous; wings fuliginous. Antennae incomplete in type; eye hairy, ocelli elevated; vertex smooth, polished, and flat; frons smooth, polished, impressed, and with a median longitudinal carina; face slightly less than twice as wide as long, smooth and polished, slightly elevated medially and with a very indistinct, short, median ridge above; clypeus about 1.50 times as wide as long, smooth and polished, and notched medially on apical margin; temple broader than eye in dorsal view; galea short. Median portion of lateral face of pronotum rugose; median lobe of mesoscutum without a longitudinal depression each side of median line; notaulices distinct and foveolate; mesopleuron smooth and polished, upper and lower grooves foveolate and posterior groove rather coarsely foveolate with a short smooth depression at the middle leading to the lower groove; anterior portion of metapleuron smooth and polished, posterior portion rugose with anterior half plain; propodeum rugose, the carinae high and distinct, and the spiracle ovate. First abscissa of radius 1.50 times as long as that of basal vein; third abscissa of cubitus shorter than fourth; recurrent vein slightly longer than second abscissa of cubitus and about one-half as long as second abscissa of basal vein; nervulus postfurcal by about 0.33 its own length; interanal vein absent. Second and fifth segments of fore tarsus about equal; apex of hind tibia not expanded into a flaring process; inner spur of middle tibia longer than basitarsus, second and fifth tarsal segments of middle leg about equal; inner spur of hind tibia about 0.80 as long as basitarsus, the basitarsus shorter than the last four tarsal segments combined, second and third tarsal segments longer than fifth; hind claws pectinate basally. First abdomi-

nal suture extending obliquely forward to the margin; second tergite slightly shorter than third medially; ovipositor sheath about 0.67 as long as abdomen (pl. 5, fig. 38).

Male.—Essentially similar to the female, a transverse black band on vertex between eyes; clypeus notched rather strongly.

Type.—In the Academy of Natural Sciences of Philadelphia.

Redescribed from the type female, from Cordova, Mexico, and a male, also from Mexico, in the Academy of Natural Sciences of Philadelphia. The male from Arizona, recorded by Ashmead, is not in the U. S. National Museum.

CARDIOCHILES TIBIATOR (Say)

Bracon tibiator SAY, Keating's Narrative of an expedition to the source of St. Peters River . . . , vol. 2, Append., p. 323, No. 1, 1824 (female).—LECONTE, Complete writings of Thomas Say on the entomology of North America, vol. 2, p. 716, No. 17, 1859.—CRESSON, Can. Ent., vol. 5, p. 68, 1873.—ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, pp. 49, 51, No. 7, 1894.

Bracon (Toxoneuron) tibiator SAY, Boston Journ. Nat. Hist., vol. 1, pt. 3, p. 259, No. 17, 1836.—LECONTE, Complete writings of Thomas Say on the entomology of North America, vol. 2, p. 715, No. 17, 1859.

Cardiochiles tibiator ASHMEAD, in Smith, Insects of New Jersey, p. 592, 1900.—VIERECK, Connecticut Nat. Hist. Surv. Bull. 22, p. 183, 1917.—LEONARD, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 913, 1928.

Female.—Length 5.5 mm. Black, anterior wing hyaline with apical third contrastingly fuliginous; posterior wing hyaline, infuscated at apex; apex of fore femur, fore tibia and tarsus entirely, basal half of middle tibia, middle tarsus, and basal third of hind tibia, yellowish white; pedicel dark ferruginous apically; middle part of mandible dark ferruginous. Antenna about 37-segmented; eye hairy; ocelli elevated; vertex shining, wrinkled and with a transverse low elevation bordering the occiput; frons transversely striate and with a very weak median longitudinal carina; face about twice as wide as long, convex, and with a complete median longitudinal carina; clypeus punctate, apical margin distinctly notched at middle, median basal part slightly elevated; temple striate, and bulging, broader than eye in dorsal view; galea short. Pubescence of thorax silvery or whitish; central portion of lateral face of pronotum rugose; median lobe of mesoscutum very shallowly impressed medially, sometimes with a shallow longitudinal impression each side of median line; the three lobes of mesoscutum a little roughened; notaulices coarsely foveolate; upper groove of mesopleuron rugose, lower groove foveate or rugoso-foveate, posterior groove foveolate with a smooth depression at the middle leading anteriorly to the lower groove; metapleuron rugose, anterior triangular portion mostly smooth; propodeum with abundant, long, silvery hair, rugose, carinae prominent, areola diamond-

shaped, spiracle long ovate. First abscissae of radius and basal vein about equal; third abscissa of cubitus much shorter than fourth; recurrent vein and second abscissa of cubitus about equal; nervulus postfurcal by about 0.67 its own length; first and second abscissae of submedius about equal; interanal vein represented by a light pigmented line. Fifth segment of fore tarsus thicker and longer than second, hind tibia flattened and broadened toward apex, but not expanded on outer apical margin; inner spur of middle tibia slightly shorter than basitarsus, second tarsal segment shorter than fifth; inner spur of hind tibia about half as long as basitarsus, basitarsus flattened and broadened, and longer than the last four tarsal segments combined; hind tarsal claws pectinate basally. First abdominal suture extending obliquely forward to the margin; second tergite about half as long as third; hypopygium in profile pointed, about as long as the first two tergites combined, its median ventral line folded; ovipositor sheath about as long as hind basitarsus, pubescent, broadened to near apex, its greatest width about equal to length of second segment of hind tarsus, the tip bent ventrally (pl. 5, fig. 19).

Male.—Essentially similar to the female.

Type.—Lost.

The material studied includes specimens from Pennsylvania, Maryland, Virginia, District of Columbia, Kentucky, Georgia, and Kansas.

CARDIOCHILES TRANSVERSUS, new species

Female.—Length 6 mm. Black, upper, outer orbits narrowly ferruginous; wings light fuliginous; fore and middle legs ferruginous, their coxae, trochanters, femora basally, and tarsi black; hind leg ferruginous, with coxa, trochanter basally, apex of tibia, and tarsus black; ovipositor sheath black. Head with long, mostly dark, hairs; antenna 33-segmented in type; eye bare; ocelli elevated; vertex smooth and polished; frons smooth and polished, and with a weak, median longitudinal raised line; face about three times as wide as long, smooth, polished, and with a short median tubercle above; clypeus smooth, polished, basal margin slightly elevated, apical margin truncate, not notched; temple slightly wider than eye in dorsal view; galea short. Median portion of lateral face of pronotum foveolate; mesonotal lobes smooth and polished, impunctate; notaulices finely foveolate; upper groove of mesopleuron coarsely foveolate, lower groove finely foveolate, short, posterior groove evenly foveolate; metapleuron rugose, the small, triangular, anterior portion smooth; propodeum finely rugulose, the carinae prominent, spiracle ovate. First abscissae of radius and basal vein about equal; third abscissa of cubitus slightly shorter than fourth; recurrent vein and second abscissa of cubitus about equal; nervulus

postfural by 0.67 its own length; first and second abscissae of submedius about equal; interanal vein represented by a pigmented line. Second and fifth segments of foretarsus about equal; apex of hind tibia not conspicuously thickened or expanded into a flaring process; inner spur of middle tibia slightly over half as long as basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia slightly over half as long as basitarsus, basitarsus flattened, shorter than the last four tarsal segments combined, second tarsal segment longer than fifth; hind tarsal claws pectinate basally. First abdominal suture extending obliquely forward to the margin, second tergite shorter than third medially; hypopygium in profile obtuse, about as long as first three tergites combined, its median ventral line without a longitudinal fold; ovipositor sheath smooth and polished, pubescent and broadly rounded at tip (pl. 5, fig. 24).

Male.—Essentially like the female.

Type.—U.S.N.M. No. 58297.

Type locality.—Los Angeles, Calif.

Described from three females and two males, all from the type locality.

***CARDIOCHILES TRUNCUS*, new species**

Female.—Length 8 mm. Ferruginous except the following: Eye grayish black; antenna except base of scape, vertex and frons except narrowly at the eyes, occiput medially, pectus, and anteroventral margin of lateral face of pronotum black; apical margin of clypeus and tip of mandible dark ferruginous; mouth parts blackish; proepisternum partly blackish; propodeum mostly blackish; tegulae ferruginous; wings fuscous, stigma and veins blackish, costa and costella ferruginous basally; legs ferruginous, fore and middle coxae entirely and hind coxae largely, basal segments of all trochanters, apex of hind tibia, last tarsal segment of foreleg, apical part of basitarsus and the remaining segments of middle tarsus, and hind tarsus, black. Pubescence very short and inconspicuous; antenna 38-segmented in type; eye bare; ocelli elevated; vertex smooth and polished; frons smooth and polished, with a small pit below anterior ocellus, and with a low median longitudinal elevation; face about 2.50 times as wide as long, punctate, with a short median ridge above, below which it is broadly, slightly elevated; clypeus punctate, the median basal part elevated, the apical margin truncate and slightly flaring, not notched; temple wider than eye in dorsal view; malar furrow about 0.80 as long as basal width of mandible; galea about 0.82 as long as long axis of eye. Median portion of lateral face of pronotum rugose; median lobe of mesoscutum distinctly though minutely punctate, lateral lobes smooth; notaulices moderately foveolate; mesopleuron closely,

minutely punctate, upper, lower, and posterior grooves foveolate, the lower groove long, almost complete; metapleuron rugose, except the small triangular basal portion which is smooth; propodeum rugose, carinae prominent, spiracle ovate, strongly oblique. First abscissa of radius longer and thicker than that of basal vein; third and fourth abscissae of cubitus about equal; second abscissa of cubitus slightly shorter than recurrent vein; nervulus postfurcal by slightly over half of its length; first abscissa of submedius shorter than second; interanal vein represented by a short stump continued by a pigmented line. Fifth segment of foretarsus longer than second; apex of hind tibia strongly thickened and expanded into a flaring process; inner spur of middle tibia about 0.67 as long as basitarsus, second and fifth tarsal segments about equal; inner spur of hind tibia slightly over half as long as basitarsus, basitarsus flattened and slightly shorter than the next four tarsal segments combined, second tarsal segment longer than fifth; hind claws pectinate basally. First abdominal suture slightly curved to the margin; second abdominal tergite slightly shorter than third medially; hypopygium about as long as the first three tergites combined, its median ventral line without a longitudinal fold; ovipositor sheath polished, pubescent at tip, spatulate, its exposed part about half as long as the hypopygium (pl. 5, fig. 18).

Male.—Essentially similar to the female but with face medially, posterior part of temple, metanotum except lateral depressions, lower half of mesopleuron, metapleuron, and propodeum black; genitalia fuscoferruginous; antenna 41-segmented.

Type.—In the Academy of Natural Sciences of Philadelphia.

Type locality.—Pine Ridge, Nebr. (July).

Described from two females and one male. The allotype is from "18 mi. E. of Lamar, Colo., 3,900 ft. elev.," H. A. Scullen.

CARDIOCHILES VIATOR (Say), new combination

Bracon (Toroneuron) viator SAY, Boston Journ. Nat. Hist., vol. 1, pt. 3, p. 258. No. 15, 1836 (female, male).—LECONTE, Complete writings of Thomas Say on the entomology of North America, vol. 2, p. 710, No. 15, 1859.

Toroneuron viator CRESSON, Can. Ent., vol. 5, p. 69, 1873.—PATTON, Psyche, vol. 7, pp. 178-179, 1894.

Toroneura viator ASHMEAD, Proc. Ent. Soc. Washington, vol. 3, pp. 49, 52, No. 11, 1894.

Cardiochiles viator VIERECK, Connecticut Geol. Nat. Hist. Survey Bull. 22, pp. 183-184, 1917 (1916).

Female.—Length 7.0 mm. Body ferruginous except the following: Antenna, vertex and frons mostly, median spot on face, occiput, lower and posterior part of cheek, malar region, apical and lateral margin of clypeus, proepisternum, sometimes more or less of middle lobe of

mesonotum, mesopleuron except anterior upper part, pectus, metapleuron, propodeum, and ovipositor sheath, black; metanotum blackish, eye grayish black; mouth parts black; wings fuliginous, costa and stigma ferruginous; legs ferruginous, with coxae and trochanters and usually anterior and middle femora basally, black, tarsi brown or blackish. Antenna usually with 31 to 33 segments; eye bare; ocelli elevated, vertex smooth and polished; frons smooth and polished, with a small depression below the anterior ocellus and with a median longitudinal keel; face about 2.50 times as wide as long, punctate, polished, and with a small median tubercle above; clypeus punctate, its basal median part slightly elevated, its apical margin slightly flaring, not notched; temple bulging, wider than eye in dorsal view; galea long and slender, about as long as the long axis of eye, tapering apically. Median part of lateral face of pronotum weakly rugose; median lobe of mesoscutum flat, smooth and shining like lateral lobes; notaulices moderately foveolate; mesopleuron closely, finely punctate, upper groove coarsely foveate, lower groove foveolate, posterior groove coarsely foveate; metapleuron punctate, rugose at apex; propodeum rugose, carinae defining areola prominent, the costulae often indistinct, spiracle long ovate. First abscissa of radius longer than that of basal vein; third and fourth abscissae of cubitus about equal; second abscissa of cubitus slightly longer than recurrent vein; nervulus postfurcal by about 0.67 its length; first abscissa of submedius slightly shorter than second; interanal vein represented by a short stump continued by a pigmented line. Fifth segment of fore tarsus longer than second; apex of hind tibia thickened on outer margin and expanded into a flaring process; inner spur of middle tibia about 0.67 as long as basitarsus, and second tarsal segment slightly shorter than fifth; inner spur of hind tibia about half as long as basitarsus, basitarsus shorter than the next four tarsal segments combined, second and fifth tarsal segments about equal; hind tarsal claws pectinate, with short teeth basally. First abdominal suture slightly curved to the margin; second tergite shorter than third medially; hypopygium in profile pointed, about as long as the first three tergites combined; its median ventral line without a longitudinal fold; ovipositor sheath polished, spatulate, pubescent at tip, its exposed part about 0.75 as long as hypopygium (pl. 5, fig. 35).

Male.—Essentially similar to the female.

Type.—Lost.

The material studied includes specimens from Connecticut, Pennsylvania, New Jersey, Maryland, Virginia, Ohio, Illinois, Kentucky, Colorado, and Texas.

KEY TO THE SPECIES OF CARDIOCHILES OF AMERICA NORTH OF MEXICO

1. Eyes hairy ----- 2
Eyes bare ----- 10
2. Vertex and frons transversely striate or wrinkled ----- 3
Vertex and frons smooth ----- 4
3. Face with a median longitudinal carina; apical third of forewing fuliginous,
the rest hyaline; about basal 0.40 of hind tibia yellowish white; hind tarsal
claw pectinate basally; length about 6 mm ----- *tibiator* (Say)
Face without a median longitudinal carina; forewing uniformly fuliginous;
hind tibia entirely blackish; hind claw toothed basally; length about
2.50 mm ----- *minutus* (Cresson)
4. Thorax at least partly ferruginous ----- 5
Thorax entirely black ----- 6
5. Thorax entirely ferruginous; second abscissa of cubitus about 1.50 times as
long as recurrent vein; recurrent vein about one-third as long as second
abscissa of basal vein; interanal vein represented by a pigmented line.
therberiae Rohwer
Thorax black, varied with ferruginous; second abscissa of cubitus slightly
shorter than recurrent vein; recurrent vein about half as long as second
abscissa of basal vein; interanal vein absent ----- *thoracicus* (Cresson)
6. Only apical third of forewing lightly infumated ----- *apicalis* (Cresson)
Forewing entirely infumated ----- 7
7. Third segment of hind tarsus nearly 1.50 times as long as fifth; hind tibia
black ----- 8
Third and fifth segments of hind tarsus about equal; hind tibia testaceous,
sometimes blackish apically ----- 9
8. Fore femur black, brownish yellowish apically; fore tibia black or blackish;
length about 4.5 mm ----- *orizabae* (Cresson)
Fore femur and tibia testaceous; length about 6 mm ----- *floridanus* (Ashmead)
9. Notaulices meeting posteriorly in an acute angle (pl. 4, fig. 9); mesopleural
furrow usually smooth ----- *explorator* (Say)
Notaulices meeting posteriorly in a broad angle (pl. 4, fig. 8); mesopleural
furrow foveolate to anterior margin of mesopleuron.
insculptus, new species
10. Anterior margin of clypeus slightly notched at middle; notaulices and
mesosulcus smooth; upper and lower grooves of mesopleuron smooth;
metapleuron smooth and polished; propodeum areolate, the areas smooth.
levis, new species
Anterior margin of clypeus not notched; notaulices foveolate (except in
brevitarsis); mesosulcus foveolate; upper and lower grooves of meso-
pleuron usually foveolate; metapleuron always rugose on posterior sec-
tion; propodeum usually areolate and always rugose ----- 11
11. Apex of hind tibia expanded outwardly into a strongly flaring process (pl. 4,
fig. 13) ----- 12
Apex of hind tibia often thickened but not expanded into a strongly flaring
process, outer edge nearly straight ----- 20
12. Galea nearly or quite as long as long axis of eye ----- 13
Galea much shorter ----- 17
13. Second segment of middle tarsus noticeably shorter than fifth ----- 14
Second segment of middle tarsus as long as fifth ----- 16
14. Costa and stigma yellowish ferruginous ----- *viator* (Say)
Costa and stigma dark brown or piceous ----- 15

15. Temple, in dorsal view, narrower than eye; galea tapering strongly on apical half, its apex subacute; hypopygium far surpassing apex of last tergite in female.....*texensis*, new species
Temple, in dorsal view, wider than eye; galea not tapering conspicuously, broadly rounded at apex; hypopygium not surpassing apex of last tergite in female.....*nebrascensis*, new species
16. Thorax black; tegulae blackish.....*abdominalis* (Cresson)
Thorax with pro- and mesonotum reddish yellow; tegulae reddish yellow.
truncus, new species
17. Hind femur unusually broad, its extreme width nearly half its length; usually mesonotum, and sometimes entire thorax ferruginous; plate of first tergite usually ferruginous..... 18
Hind femur much more than twice as long as its extreme width; thorax black, occasionally mesonotum varied with ferruginous; plate of first tergite black..... 19
18. Head, thorax, legs including coxae, costa, and stigma reddish yellow.
rubicundus, new species
Head and thorax black, varied with ferruginous; all coxae black; costa and stigma blackish.....*magnus*, new species
19. Propodeal carinae well-developed, the areas sharply defined; wings strongly infumated throughout.....*rufostigma*, new species
Propodeal carinae very weak, the areas not defined; wings strongly infumated apically, subhyaline basad of stigma.....*dilatus*, new species
20. Legs entirely black..... 21
Legs more or less extensively ferruginous..... 22
21. Wings entirely fuliginous; second segment of middle tarsus about as long as fifth.....*pluto* (Ashmead)
Wings hyaline with apical third to two-fifths fuliginous; second segment of middle tarsus shorter than fifth.....*nigricans*, new species
22. Thorax entirely black..... 23
Thorax more or less ferruginous..... 28
23. Costa and stigma bright ferruginous; head with ferruginous orbital markings.....*dignus*, new species
Costa and stigma dark brown or piceous; head entirely black, except sometimes clypeus obscurely reddish..... 24
24. Abdomen black..... 25
Abdomen more or less extensively, often entirely, ferruginous..... 26
25. Mesoscutum and scutellum closely, finely punctate; face closely punctate, its vestiture short, not conspicuous; propodeal carinae weak, only the areola distinctly defined.....*californicus* (Ashmead)
Mesoscutum and scutellum smooth and polished; face polished, impunctate, and clothed with conspicuous, long, blackish hair; propodeal carinae prominent, all areas sharply defined.....*transversus*, new species
26. Frons distinctly wrinkled behind scapes; occiput aciculate; scutellum sculptured on apical half; mesopleuron mostly rugulose punctate.
nigroclypeus Viereck
Frons, occiput, and scutellum smooth and shining; mesopleuron smooth.. 27
27. Wings subhyaline on basal half, infumated on apical half.
arugosus, new species
Wings entirely infumated.....*arugosus* var. *pullus*, new variety
28. Costa and stigma bright orange; head, except large spot on front and vertex, ferruginous.....*rubidus*, new species
Costa and stigma dark brown or piceous; head largely black..... 29

29. Propodeum finely rugulose, the median area defined by weak carinae, the other areas not delimited; second tergite as long as third.

tennessensis, new species

Propodeum coarsely rugose, areas defined by prominent carinae; second tergite shorter than third----- 30

30. Notaulices smooth; hind tarsus not longer than hind tibia.

brevitarsis, new species

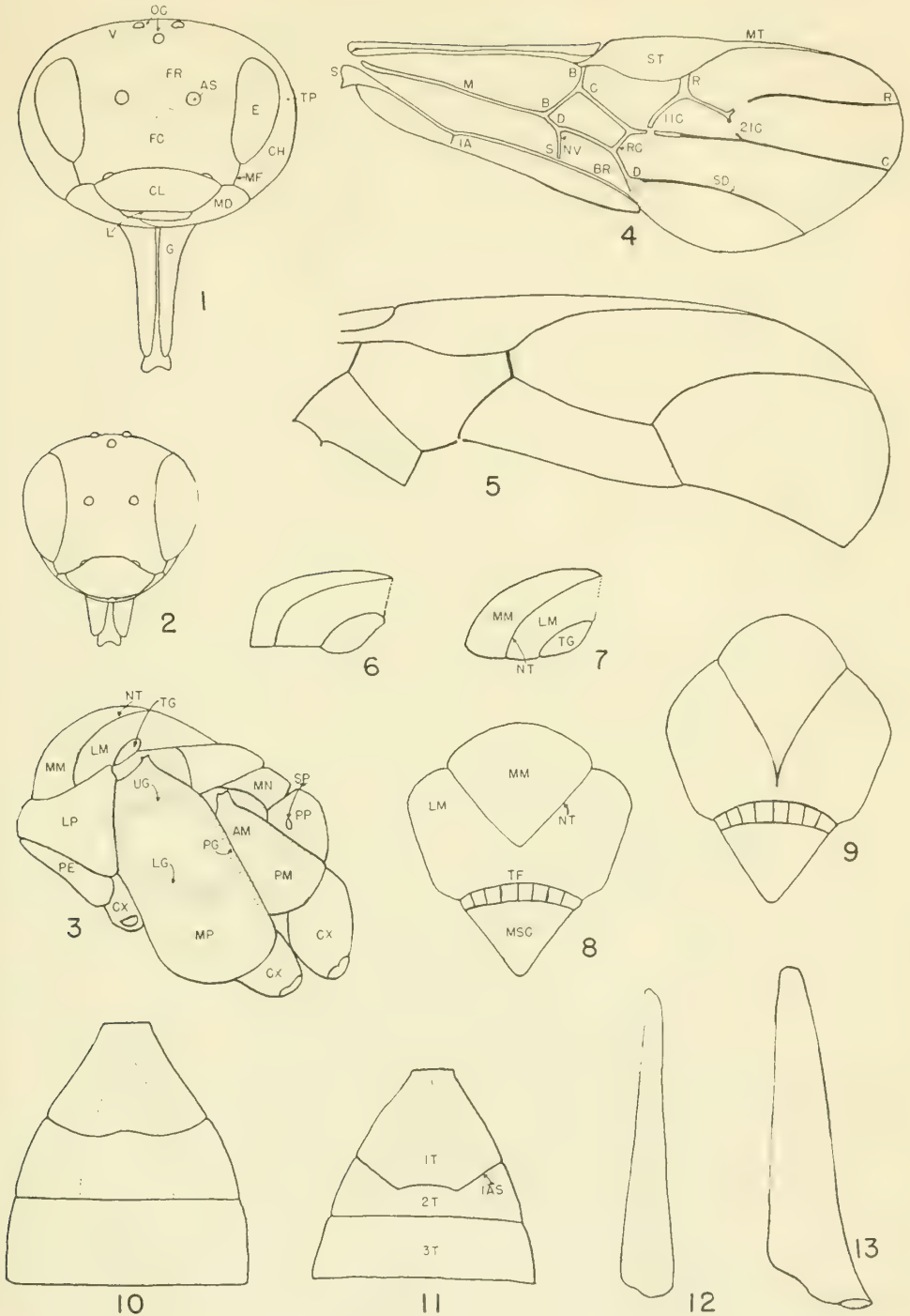
Notaulices foveolate; hind tarsus a little longer than hind tibia----- 31

31. Mesoscutum entirely ferruginous; anterior and middle femora and tibiae reddish yellow, the former sometimes blackish basally; first intercubitus gently curved, not angulate-----seminiger (Cresson)

Mesoscutum black anteriorly; anterior and middle femora and tibiae largely black or piceous; first intercubitus usually distinctly angulate below middle-----nigriceps Viereck

ABBREVIATIONS USED ON PLATES

AM, anterior portion of metapleuron; AS, antennal socket; B-B, basal vein; BR, brachial vein; C-C, cubitus; CH, cheek; CL, clypeus; CX, coxa; D-D, discoidal vein; E, eye; FC, face; FR, frons; G, galea; HP, hypopygium; IA, interanal vein; L, labrum; LG, lower groove of mesopleuron; LM, lateral lobe of mesonotum; LP, lateral face of pronotum; M, medius; MD, mandible; MF, malar furrow; MM, median lobe of mesonotum; MN, mesonotum; MP, mesopleuron; MSC, mesoscutellum; MT, metacarpus; MTN, metanotum; MTP, metapleuron; NT, notaulix; NV, nervulus; OC, ocelli; PE, proepisternum; PG, posterior groove of mesopleuron; PM, posterior portion of metapleuron; PP, propodeum; RC, recurrent vein; R-R, radius; SD, subdiscoidal vein; SP, spiracle; S-S, submedius; ST, stigma; TF, transverse fossa; TG, tegula; TP, temple; UG, upper groove of mesopleuron; V, vertex; 1AS, first abdominal suture; 1IC, first intercubital vein; 1T, first tergite; 2IC, second intercubital vein; 2T, second tergite; 3T, third tergite; 8T, eighth tergite.



1, *Cardiochiles viator*, front view of head; 2, *C. floridanus*, front view of head; 3, *Cardiochiles*, diagrammatic lateral view of thorax; 4, *C. apicalis*, forewing; 5, *C. nigriceps*, part of forewing; 6, *C. seminiger*, lateral view of anterior part of mesonotum; 7, *C. nigriceps*, lateral view of anterior part of mesonotum; 8, *C. operculeus*, dorsal view of anterior part of mesonotum; 9, *C. explorator*, dorsal view of anterior part of mesonotum; 10, *C. seminiger*, first three abdominal tergites; 11, *C. tibiator*, first three abdominal tergites; 12, *C. tibiator*, tibia; 13, *C. magnus*, tibia.



Hypopygium and ovipositor sheath of *Cardiophiles*: 14, *C. magnus*; 15, *C. explorator*; 16, *C. texensis*; 17, *C. nebrascensis*; 18, *C. truncus*; 19, *C. tibiator*; 20, *C. californicus*; 21, *C. tennesseensis*; 22, *C. dilatus*; 23, *C. insculptus*; 24, *C. transversus*; 25, *C. rubidus*; 26, *C. apicalis*; 27, *C. minutus*; 28, *C. seminiger*; 29, *C. dignus*; 30, *C. floridanus*; 31, *C. levis*; 32, *C. rubicundus*; 33, *C. nigriceps*; 34, *C. orizabae*; 35, *C. viator*; 36, *C. arugosus*; 37, *C. rufostigmus*; 40, *C. abdominalis*.
 Ovipositor sheath: 38, *C. thoracicus*; 39, *C. therberiae*.

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A REVIEW OF THE MITES OF THE FAMILY CHEYLETIDAE IN THE UNITED STATES NATIONAL MUSEUM

By EDWARD W. BAKER

THE family Cheyletidae Leach, 1814, as previously considered included two groups of mites, those with small, poorly developed, non-grasping palpi (*Myobia*, etc.) and those with large, highly developed, grasping palpi (*Cheyletus*, etc.). The former are parasitic mites and are adapted to live on such hosts as birds, snakes, and rats, while the latter are primarily free-living predators.

Ewing (Proc. Ent. Soc. Washington, vol. 40, No. 7, p. 180, 1938) erected the subfamily Myobiinae to include those mites of the genus *Myobia* and its generic derivatives. In this paper, Myobiinae is raised to family rank and is considered to include the following genera: *Amorphacarus* Ewing, *Harpyrhynchus* Megnin, *Myobia* Heyden, *Ophioptes* Sambon, *Picobia* Haller, *Protomyobia* Ewing, *Psorergates* Tyrrel, *Radfordia* Ewing, and *Syringophilus* Heller.

The family Cheyletidae is now considered to include the following genera: *Acaropsis* Moquin-Tandon, *Chelacaropsis* new genus, *Chel-etoids* Oudemans, *Cheletogenes* Oudemans, *Cheletomimus* Oudemans, *Cheletomorpha* Oudemans, *Cheletonella* Womersley, *Cheletophanes* Oudemans, *Cheletophyes* Oudemans, *Cheletopsis* Oudemans, *Cheletosoma* Oudemans, *Chelonotus* Berlese, *Cheyletia* Haller, *Cheyletiella* Canestrini, *Cheyletus* Latreille, *Eucheyla* Berlese, *Eucheyletia* new genus, *Eutogenes* new genus, and *Neocheyletiella* new genus.

The Cheyletidae are prostigmatic mites with short styletlike chelicerae; with a short palpal tarsus located on the posterior part of the palpal tibia rather than on tip and in most cases bearing comblike and sicklelike setae; palpal tibia with a strong claw which

extends beyond the palpal tarsus; with none, one, or more plates on the dorsum of the body; and with the palpi large and pincerlike.

These mites as a whole are free-living predators, although some are to be found in rabbit fur, squirrel fur, bird feathers, on cats, etc. The free-living forms are found associated with infestations of acarid mites (Acaridae), eriophyid mites (Eriophyidae), and scale insects (Coccoidea), but as yet they do not appear to be of great importance in controlling mites or insects. Carter et al. (Carter, H. F., Wedd, G., and D'Abbrera, V., Indian Med. Gaz., vol. 79, No. 4, pp. 163-168, 1944) report finding numerous mites in the sputum of patients suffering from lung disorders, among these being a *Cheyletus* sp. Habits of each species are listed in the main body of this report. Because of their free-living habits the distribution of many of these mites is world-wide.

Since several of the genera are established on the number of dorsal plates, confusion may arise because some of the nymphal forms have two or more dorsal posterior plates instead of one. For example, the nymph of *Cheletophyes hawaiiensis*, new species, possesses two dorsal posterior plates, the nymph of *Cheyletus cacahuamilpensis*, new species, possesses four dorsal posterior plates, and Oudemans (1921) in discussing the generic status of *Cheletomimus* states that the nymph of *Cheyletia squamosa* (Degeer) has two dorsal posterior plates. Adults of *Cheletonella* and *Cheletopsis* have only the single dorsal anterior plate; adults and nymphs of *Cheletomimus* have a single anterior plate and two posterior plates; and adults of the other genera have the usual anterior and posterior plates.

The descriptions are based on material mounted on slides in balsam, modified Berlese fluid, or polyvinyl alcohol (PVA), and in most cases the material has been flattened to some degree. The so-called balloon setae of certain mites have been seen only on specimens which have been mounted, and have been drawn as seen. The exact nature of these setae on living mites is not known. Certain other types of setae present the same problem.

Only species in the National Museum Collection have been described and figured. The other species are placed in the keys and are listed in the text.

Since Oudemans monographed the family in 1906, only a selected bibliography of publications prior to that date is given, but references to all important taxonomical publications since then are listed. Vitzthum (Die Tierwelt Mitteleuropas, vol. 3, No. 3, pp. 54-56, 1929) gives keys to the European species, and Rodendorf (Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, pp. 69-98, 1940) gives keys to the Russian species.

Types of new species, unless otherwise stated, are deposited in the United States National Museum.

KEY TO THE GENERA

1. Palpal tarsus with comblike and/or sicklelike setae_____	3
Palpal tarsus with only simple setae_____	2
2. Tarsus I without claws but with a rayed pulvillus_____	Cheyletiella Canestrini
Tarsus I with claws_____	Neochyletiella, new genus
3. Palpal tarsus with both sickle- and comblike setae_____	4
Palpal tarsus with 2 sickle- and no comblike setae; hysterosomal shield only.	Cheletoides Oudemans
4. Palpal tarsus with 2 sickle- and 2 comblike setae_____	5
Palpal tarsus with 2 sickle- and 1 comblike setae_____	15
5. Leg I normal, with 2 claws_____	8
Leg I a sensory organ, without claws_____	6
6. With lenslike eyes_____	7
Without lenslike eyes; no claws or pulvillus on legs I_-	Eutogenes, new genus
7. Tarsus I attenuate at tip, with pulvillus but without claws.	Cheletomorpha Oudemans
Tarsus I ending bluntly, without claws or pulvillus__	Cheletogenes Oudemans
8. With more than 1 dorsal shield_____	9
With a single hysterosomal shield_____	Cheletonella Womersley
9. With 2 dorsal shields_____	10
With 3 dorsal shields, 1 propodosomal and 2 hysterosomal.	Cheletomimus Oudemans
10. With a pair of lenslike eyes_____	11
Without lenslike eyes_____	14
11. Both sicklelike palpal tarsal setae normal_____	12
One palpal tarsal sicklelike seta clavate; dorsal body setae broad, reticulate; dorsum of body may be reticulate_____	Eucheyla Berlese
12. Palpal claw with basal teeth_____	13
Palpal claw toothed along entire inner margin___	Cheletophanes Oudemans
13. Dorsal body setae squamiform_____	Cheyletia Haller
Dorsal body setae long, rodlike, ciliated_____	Cheletophyes Oudemans
14. Dorsal marginal setae squamiform; dorsal setae cloudlike.	Euchyletia, new genus
Dorsal marginal setae featherlike, or pilose; dorsal setae when present stag- hornlike_____	Cheyletus Latreille
15. With 1 or more dorsal shields_____	16
Without dorsal shields_____	Chelacaropsis, new genus
16. With propodosomal and hysterosomal shields_____	17
With propodosomal shield only_____	Cheletopsis Oudemans
17. With the 2 dorsal shields separate_____	18
With the 2 dorsal shields contiguous, covering entire dorsum and part of venter_____	Chelonotus Berlese
18. Anterior shield trapezoidal_____	Acaropsis Moquin-Tandon
Anterior shield pentagonal_____	Cheletosoma Oudemans

In A. M. Buitendijk's paper, "Voorloopige Catalogus van de Acari in de Collectie—Oudemans" (Zool. Meded., vol. 24, p. 332, 1945), a reference is made to *Caenocheyletes franseni* Oudemans, 1933. This is probably a manuscript name, since I have been unable to find a published description.

Genus CHEYLETIELLA Canestrini

Cheyletiella CANESTRINI, Prospetto dell' Acarofauna Italiana, vol. 2, pp. 169, 170, 1886.

Cheleticella (Canestrini) OUDEMANS, Mém. Soc. Zool. France, vol. 19, p. 211, 1906.

Ewingella VAIL and AUGUSTSON, Journ. Parasitol., vol. 29, No. 6, pp. 419, 421, 1943. (Type, *Ewingella americana* Vail and Augustson (monotypic) = *Cheyletiella parasitivorax* (Megnin).)

Type, *Cheyletus parasitivorax* Megnin (monotypic).

CHEYLETIELLA PARASITIVORAX (Megnin)

PLATE 6, FIGURES 1-3

Cheyletus parasitivorax MEGNIN, Journ. Anat. and Physiol., 1878, p. 10, pl. 38.

Cheyletiella parasitivorax (Megnin) CANESTRINI, Prospetto dell'Acarofauna Italiana, vol. 2, pp. 169, 170, 1886.—BERLESE, Acari, Myriapoda et Scorpiones hucusque in Italia reperta, Prostigmata, fasc. 28, No. 3, 1886.—HIRST, Brit. Mus. Nat. Hist. Econ. Ser. 13, p. 73, fig. 40, 1922.—COOPER, Journ. Parasitol., vol. 32, No. 5, pp. 480-482, 1946.

Cheleticella parasitivorax (Megnin) HIRST, Ann. Mag. Nat. Hist., vol. 20, p. 132, 1917.—PILLARS, Vet. Journ., London, vol. 81, pp. 96, 97, 1925.—WOMERSLEY, Rec. South Austral. Mus., vol. 7, p. 59, 1941.

Ewingella americana VAIL and AUGUSTON, Journ. Parasitol., vol. 29, No. 6, pp. 419-421, figs. 1-3, 1943.

Female.—Palpi short but strong; palpal femur with a long, serrate, dorsal seta; genu with a short, serrate seta; tibia with a short simple seta; palpal claw curved downward, with many weak teeth. Rostrum short, broad; peritreme with lateral branches composed of large segments, the anterior transverse portion composed of many small segments. Propodosomal shield with three pairs of short anterior lateral setae and a posterior transverse row of four simple setae; two pairs of long, serrate propodosomal shoulder setae. Hysterosoma without shield; with an anterior transverse row of four setae, the outer pair serrate and longer than the simple inner pair (outer setae 106μ long, inner setae 83μ long); on the posterior third of the hysterosoma a pair of long, serrate, marginal setae, and anterior to these a pair of short, simple setae. Posterior margin of hysterosoma with a pair of long, simple setae (about 200μ long), a pair of short simple setae inside the long pair, and two pairs of short, simple setae anterior to anal opening; three pairs of short, simple setae lateral of the anal opening. Two pairs of genital setae and a transverse row of four setae anterior to the genital opening. Legs short; leg I reaches to tip of palpi; leg IV reaches past posterior margin of body. Tarsus I short, without claws but with pulvillus as figured. Length of body 320μ , including rostrum 386 ; width 266μ .

Type host.—Rabbit; preying on listrophorid mites.

Type locality.—Probably France.

The foregoing description was taken from mites collected on rabbits at Albany, N. Y., May 7, 1942, by R. D. Glasgow.

This is a well-known species which appears to be universally distributed on rabbits. It has been stated that it preys on species of *Listrophorus*, *Psorergates*, *Myobia*, and *Notoedrus* which inhabit the fur. Pillars (1925) states that he found this mite causing lesions on a rabbit, and also mentions a mange of man attributed to this species. Vail and Augustson (1943) report lesions being found on a rabbit infested with this mite. Cooper (1946), in a review of the literature on the mite, states that he can find no satisfactory evidence that *Cheyletiella parasitivorax* attacks its mammalian hosts or causes mange in rabbits and man. Hirst (1917), Pillars (1925), and Cooper (1946) report finding this species on cat. Cooper (1946) also discusses the synonymy of *Ewingella americana* Vail and Augustson with *Cheyletiella parasitivorax* (Megnin).

H. E. Ewing (Illinois Univ. Studies, vol. 3, No. 6, p. 77, pl. 3, fig. 15, 1909) described a mite as *Cheyletiella americana*. Examination of the type reveals that the original placement is incorrect; it belongs to the genus *Pseudocheylus* in the family Pseudocheylidae.

NEOCHEYLETIELLA, new genus

Palpal tarsus without comblike setae; all tarsi with claws. With at least a rudimentary dorsal shield.

Type, *Neocheyletiella rohweri*, new species.

This genus has been erected to include the species formerly placed with *Cheyletiella* which possess claws on tarsus I. Biologically this group differs from *Cheyletiella* in being found on birds rather than on rabbits or cats.

KEY TO THE SPECIES OF NEOCHEYLETIELLA

1. Empodium split into 2 sections between claws..... 2
Empodium with 2 small combs..... 3
2. Epimera I separated..... macronycha (Megnin)
Epimera I joined..... microrhyncha (Berlese and Trouessart)
3. Large protuberance on dorsal distal surface of tarsus I; smaller on tarsus II... 4
Tarsi I and II more normal, no protuberance..... 7
4. One dorsal shield..... 5
Two dorsal shields; dorsal marginal setae about as long as body is wide.
canadensis (Banks)
5. First three pairs of propodosomal setae of approximately equal length.... 6
First 2 pairs of propodosomal setae much shorter than third pair.
heteropalpus (Megnin)
6. Posterior marginal setae about one-third longer than anterior marginal setae;
1 pair posterior setae serrate..... smallwoodae, new species
Posterior marginal setae about twice as long as anterior marginal setae; all
posterior setae simple..... rohweri, new species
7. One dorsal shield; palpal claw very small... chanayi (Berlese and Trouessart)
Two dorsal shields; palpal claw moderately large..... pinguis (Berlese)

NEOCHEYLETIELLA MACRONYCHA (Megnin), new combination

Cheyletus macronycha MEGNIN, Journ. Anat. and Physiol., 1878, p. 12, pl. 29, figs. 7, 8.

Cheleticella macronycha (Megnin) OUDEMANS, Mém. Soc. Zool. France, vol. 19, pp. 212, 213, 1906.

Type host.—Passerine birds (exotic).

Type locality.—Bengal.

NEOCHEYLETIELLA MICRORHYNCHA (Berlese and Trouessart), new combination

Cheleticella microrhyncha BERLESE and TROUESSART, Bull. Bibl. Sci. Ouest., vol. 2, p. 136, 1889.

Cheleticella microrhyncha (Berlese and Trouessart) OUDEMANS, Mém. Soc. Zool. France, vol. 19, p. 213, 1906.

Type host.—Unknown.

Type locality.—France.

The publication containing the original description could not be found.

NEOCHEYLETIELLA CANADENSIS (Banks), new combination

PLATE 6, FIGURES 4, 5

Cheleticella canadensis BANKS, Proc. Ent. Soc. Washington, vol. 11, p. 133, 1909.

Female.—Anterior shield covering most of propodosoma, with a pair of long setae in the posterior marginal corners; five pairs of long marginal setae on propodosoma; all setae about length of propodosoma. Posterior shield covering most of hysterosoma, posterior margin of shield concave and with a short seta in each corner as figured; a pair of long shoulder setae, and two pairs of long posterior setae on abdomen, all as long as propodosomal setae. Tarsi I and II with dorsal protuberance. Length 253 μ ; width 167 μ .

Type host.—"Bluebird."

Type locality.—Guelph, Ontario, Canada.

This species is similar to *Neocheyletiella heteropalpus* (Megnin) in having the tarsal protuberances, but it differs in having two dorsal shields and extremely long dorsal setae; it differs from *N. pinguis* (Berlese) in having the long propodosomal setae and in having two pairs of long posterior setae rather than one long and one short pair. The above description was taken from the type which is in the Museum of Comparative Zoology, Cambridge, Mass.

NEOCHEYLETIELLA HETEROPALPUS (Megnin), new combination

Cheyletus heteropalpus MEGNIN, Journ. Anat. and Physiol., 1878, p. 11, pl. 29.

Cheyletiella heteropalpus (Megnin) BERLESE, Acari, Myriapoda et Scorpiones hucusque in Italia reperta, Prostigmata, fasc. 28, No. 2, 1886.

Cheleticella heteropalpa (Megnin) OZ45III(&:, Mém. Soc. Zool. France, vol. 19, p. 213, 1906.

Type host.—Pigeons and passerine birds.

Type locality.—Probably France.

NEOCHEYLETIELLA SMALLWOODAE, new species

PLATE 6, FIGURES 6-9

Female.—This species is broad, rounded, with small rostrum and palpi. Palpal setae long, the palpal femur and genual setae serrate, and the tibial and ventral setae appear simple; claw small and simple. Peritreme composed of 10 rather large segments. Propodosomal shield small, longer than wide, angularly pyriform with a pair of anterolateral setae; two pairs of anteromarginal setae and three pairs of shoulder setae; all propodosomal setae appear finely serrate. Hysterosoma with three pairs of anterior setae, the outer two pairs long and distinctly serrate, the inner pair short and appearing slightly serrate; two pairs of simple dorsal setae around anal opening; three pairs of longer setae on posterior margin of body, the anteromarginal pair serrate, the other two pairs simple. Legs short; leg I about 155μ long; leg IV about same length and reaches to posterior edge of body. Tarsus I as figured, distinctive in having a strong dorsal anterior protuberance with heavy spines. Tibia I with a minute rod-like sensory seta. Length of body 455μ , including rostrum 546μ ; width 323μ .

Male.—In general similar to female. Propodosomal setae arranged as in female, but as far as can be determined the shield setae are simple, and the pair of inner shoulder setae appear to be simple. Hysterosoma with few setae, a single pair of long serrate anteromarginal setae; genital opening dorsal and in center of hysterosoma, the genital plates with three pairs of short simple setae, and anterior and lateral to the genital opening are three pairs of short setae as figured, only the outer pair appearing slightly serrate. Leg I not reaching to tip of rostrum; leg IV reaching past posterior margin of body. Length of body 300μ , including rostrum 366μ ; width 260μ .

Type host.—*Leucosticte australis*.

Type locality.—Guffey, Colo.

Type.—U.S.N.M. No. 1755.

The type female, two paratype females, and one male were collected by C. Rohwer, December 5, 1939. Another female was collected from robin at Fort Dupont, Del., April 13, 1933, by H. S. Peters.

This mite differs from *Neocheyletiella heteropalpus* (Megnin) as figured, in that Megnin's species possesses much long body setae, except for the two anterior propodosomatic pair which are extremely short in the female.

NEOCHEYLETIELLA ROHWERI, new species

PLATE 6, FIGURE 10

Female.—Mite with small rostrum; palpal setae long, femur and genual setae serrate; tibial and ventral setae appear simple; palpal claw small; palpi similar to those of *N. heteropalpus*. Peritreme composed of 11 large segments. Propodosomatic shield rather rudimentary, small, longer than wide, and broadest near anterior edge, with a single pair of serrate setae. Anterior to shield is a pair of serrate setae arising from ventral portion of propodosoma; slightly laterad of shield setae is a pair of serrate setae, on posterior corners of propodosoma are three pairs of serrate setae; all propodosomatic setae are of medium length. On anterior portion of hysterosoma are two pairs of medium length lateral serrate setae and a pair of short dorsomedian serrate setae; on posterior margin of mite are three pairs of very long simple setae which are about twice as long as the other setae, two pairs are dorsal and the inner pair is slightly ventral. All body setae large. Tarsi as in *heteropalpus*, with a large tubercle on tarsus I and slightly smaller one on tarsus II; tarsal claws large. Length of body 300μ , including rostrum 367μ ; width 233μ .

Type host.—*Sitta pygmaea melanotis*.

Type locality.—Guffey, Colo.

Type.—U.S.N.M. No. 1756.

A single female was taken at the type locality by C. Rohwer, December 5, 1939.

This species is differentiated from *smallwoodae* by the presence of the long, simple posterior setae, in having larger (stronger) body setae, and in having comparatively larger tarsal claws.

NEOCHEYLETIELLA CHANAYI (Berlese and Trouessart), new combination

PLATE 6, FIGURES 11-13

Cheyletiella chanayi BERLESE and TROUESSART, Bull. Bibl. Sci. Ouest., vol. 2, p. 135, 1889.—BERLESE, Acari, Myriapoda et Scorpiones hucusque in Italia reperta, Prostigmata, fasc. 56, No. 3, 1889.

Female.—Mite with broad rostrum; slender but short palpi. Femur of palpi with short simple setae on venter and a long serrate dorsal seta; genu with a long dorsal serrate seta and a simple lateral seta; tibia with simple setae of varying lengths as figured; claw small, curved and apparently without teeth. Peritreme composed of long, slender segments. Propodosomal shield small, anterolateral margin with a pair of long outer setae and a pair of short inner setae; posterior portion of shield with a pair of long and a pair of short setae. Hysterosoma without shield; two pairs of short simple anterior setae and a pair of posterior dorsal submedian setae, all of which appear to arise

from small plates; near posterior margin of body a pair of long setae and several pairs short setae. Two pairs of long setae arising near genital opening and extending past margin of body. Legs short, leg I reaching to tip of palpus and leg IV to posterior edge of abdomen. Tarsus I with two claws and comblike pulvillus, and with simple terminal setae. Tibia I with a short rodlike sensory seta and several simple setae of varying lengths. Length of body 493μ , including rostrum 553μ ; width 333μ .

Type host.—*Fringilla coelebs*.

Type locality.—Lyon, France.

The above description is based on a United States National Museum specimen which is from the Berlese collection. In Europe the mite has been reported from *Motacilla alba* and *Fringilla coelebs*.

NEOCHEYLETIELLA PINGUIS (Berlese), new combination

Cheyletiella pinguis BERLESE, Acari, Myriapoda et Scorpiones hucusque in Italia reperta, Prostigmata, fasc. 56, No. 3, fig. 2, 1889.

Cheyletiella pinguis (Berlese) OUDEMANS, Mém. Soc. Zool. France, vol. 19, p. 213, 1906.—WOMERSLEY, Rec. South Austral. Mus., vol. 7, No. 1, p. 59, figs. 6A, B, C, 1941.

Type host.—*Turdus merula* (= *Merula nigra*).

Type locality.—Florence, Italy.

Genus CHELETOIDES Oudemans

Cheletoides OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 17, p. 154, 1904.

Type, *Syringophilus uncinatus* Heller (monotypic).

CHELETOIDES UNCINATA (Heller)

Syringophilus uncinatus HELLER, Die Schmarotzer . . . p. 188, 1880.

Cheletoides uncinatus (Heller) OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 17, p. 154, 1904.

Cheletoides uncinata (Heller) OUDEMANS, Mém. Soc. Zool. France, vol. 19, pp. 204–211, figs. 63–66, 1906.

Type host.—*Pavo cristatus*.

Type locality.—Kiel, Germany. According to Oudemans (1906), this species probably is to be found wherever the host is established.

Genus CHEYLETUS Latreille

Cheyletus LATREILLE, Précis des caractères génériques des insectes . . . p. 179, 1796.

Eutarsus HESSLING, Illustr. Med. Zeit., vol. 1, p. 258, 1852. (Type, *Eutarsus cancriformis* Hessling (monotypic) = *Cheyletus eruditus* (Schrank).)

Cheletes (Latreille) OUDEMANS, Tijdschr. Ent., vol. 46, p. 121, 1903.

Type, *Acarus eruditus* Schrank (monotypic).

In the other genera of the Cheyletidae most of the species are based on the females, but in *Cheyletus* we find some species based entirely

on heteromorphic males. Because of this difficulty the key to the species is given for both sexes. It is hoped that in the future the sexes can be correlated.

Cheyletus butleri Hughes and *C. munroi* Hughes, both males, were described by A. M. Hughes in "The Mites Associated with Stored Food Products," Ministry of Agriculture and Fisheries, London, 1948, which was received after this paper was submitted for publication.

KEY TO THE SPECIES OF CHEYLETUS

Females

1. Dorsal setae pilose----- 2
Dorsal setae smooth (?)----- *parumsetosus* Karpelles*
2. Inner palpal comb with at least 8 teeth----- 3
Inner palpal comb with 6 teeth----- *promptus* Quedemans*
3. Femur of palpus distinctly longer than wide----- 4
Femur of palpus about as long as wide----- 6
4. Palpal claw with 3 distinct basal teeth----- 5
Palpal claw with 2 simple basal teeth; posterior dorsal shield with 3 pairs of setae----- *eruditus* (Schränk)
5. Tarsus I sensory organ shorter than the guard seta... *hendersoni*, new species
Tarsus I sensory organ longer than the guard seta----- *doddi*, new species
6. Anterior dorsal shield with 4 pairs of dorsal setae; posterior shield with at least 2 pairs----- 7
Anterior dorsal shield with 6 pairs of dorsal setae; posterior shield with 1 pair----- *strenuus* Oudemans
7. Shoulder setae simple, pilose----- 8
Shoulder setae lanceolate; posterior shield with 3 pairs of marginal setae. *trouessarti* Oudemans
8. Claw of palpus with more than 1 tooth----- 9
Claw of palpus with 1 tooth----- *fortis* Oudemans
9. Palpal claw with 2 teeth----- 12
Palpal claw with 3 or more teeth----- 10
10. Palpal claw with 3 teeth----- 11
Palpal claw with 4 teeth, the basal pair smaller than others. *linsdalei*, new species
11. Posterior shield scarcely narrower than anterior shield; dorsal palpal femoral seta pilose----- *schneideri* Oudemans
Posterior shield considerably narrower than anterior; dorsal palpal femoral seta simple----- *trux* Rodendorf
12. Posterior dorsal shield with less than 4 pairs of marginal setae----- 13
Posterior dorsal shield with 4 pairs of marginal setae; tarsus I guard seta pilose, about 4 times as long as sensory seta... *cacahuamilpensis*, new species
13. Posterior shield with 3 pairs of marginal setae----- 14
Posterior shield with 2 pairs of marginal setae; tarsus I guard seta pilose, about twice as long as sensory seta----- *beauchampi*, new species
14. Tarsus I guard seta not longer than sensory seta----- 16
Tarsus I guard seta about twice as long as sensory seta----- 15
15. Sensory seta on tarsus I strongly lanceolate----- *aversor* Rodendorf
Sensory seta on tarsus I slightly lanceolate----- *davisi*, new species

* See p. 319.

16. A distinct ventral condyle on venter of rostrum over trochanter; shoulder seta smooth; coxa III with a lanceolate-serrate seta_____ *rapax* Oudemans
 A minute ventral condyle on venter of rostrum over trochanter; shoulder seta pilose; coxa III with a simple pilose seta_____ *malaccensis* Oudemans

Males

1. Palpal claw with a single tooth_____ 2
 Palpal claw with more than 1 tooth_____ 15
2. Dorsal anterior plate with 5 pairs of setae_____ 3
 Dorsal anterior plate with 6 pairs of setae_____ 4
3. Palpal claw with a strong basal tooth; palpal femoral seta extending to tip of palpal claw_____ *trouessarti* Oudemans
 Palpal claw with a weak, hardly discernible basal tooth; palpal femoral seta not surpassing palpal tibia_____ *trux* Rodendorf
4. Femur of palpus swollen_____ 5
 Femur of palpus not swollen_____ 8
5. Dorsal posterior plate with 5 pairs of setae_____ 6
 Dorsal posterior plate with 6¹ pairs of setae_____ *malaccensis* Oudemans
6. No pilose seta between coxal plates II and III_____ 7
 A pilose seta between coxal plates II and III_____ *fortis* Oudemans
7. Small tooth on palpal claw; inner palpal comb without teeth on proximal portion_____ *audax* Oudemans
 Large tooth on palpal claw; inner palpal comb with teeth along entire inner edge_____ *rapax* Oudemans
8. Palpal claw tooth lateral_____ 9
 Palpal claw tooth more or less dorsal_____ *alacer* Oudemans
9. Palpal claw tooth distinct, width equal to length_____ 10
 Palpal claw tooth very weak, hardly discernible, much longer than wide.
carنيفex Zakhvatkin
10. Inner comb with 5 or 6 teeth_____ 11
 Inner comb with 8 or more teeth_____ 12
11. Rostrum narrow, with smooth edges_____ *venator* Vitzthum
 Rostrum broadening toward rear and with tuberculate edges.
rabiosus Rodendorf
12. Inner comb with 8 or 9 teeth_____ 13
 Inner comb with about 18 teeth_____ *acer* Oudemans
13. Anterior to peritreme 4-6 longitudinal rows of tubercles_____ 14
 Anterior to peritreme a transverse row of tubercles directed back toward peritreme_____ *ferox* Berlese and Trouessart
14. Dorsal posterior plate with straight lateral border; femur of palpus without swelling; in front of peritreme is a space without tubercles.
intrepidus Oudemans
 Dorsal posterior plate with concave lateral borders; femur of palpus with slight inner swelling; a mass of tubercles in front of peritreme.
vorax Oudemans
15. Rostrum with lateral teeth_____ 16
 Rostrum smooth, without lateral teeth; palpal claw with 2 small but well-defined teeth_____ *eruditus* (Schränk)

¹ Based on Oudemans's key (1906). The shield boundary is not distinct, and there may be five pairs of setae present, thus keying out to *rapax*, which, when types can be studied, may prove to be the same as *malaccensis*.

16. Rostrum with sharply angular protuberances or lateral teeth; palpal claw with 2 or 3 weak teeth; palpal claws broad and slightly curved.

furibundus Rodendorf

- Rostrum with small, readily discernible lateral teeth; palpal claw with 2 short thick teeth; palpal claw thin and long----- *praedabundis* Kuzin

CHEYLETUS ERUDITUS (Schrank)

PLATE 7, FIGURES 14-16

Acarus cruditus SCHRANK, Enumeratio insectorum Austriae indigenorum, p. 513, 1781.

Eutarsus cancriformis HESSLING, Illustr. Med. Zeit., vol. 1, p. 258, 1852.—OUDEMANS, Tijdschr. Ent., vol. 81, p. lxxv, 1938.

Cheyletus jerox BANKS, Proc. Ent. Soc. Washington, vol. 7, p. 134, 1906 (new synonymy).

Cheletes cruditus (Schrank) OUDEMANS, Mém. Soc. Zool. France, vol. 19, pp. 84-88, fig. 18, 1906.

Cheyletus seminiivorus (Packard) EWING, Illinois Univ. Studies, vol. 3, No. 6, pp. 76, 77, 1909; Journ. Econ. Ent., vol. 5, No. 5, pp. 416-420, 1912.

Cheyletus eburneus HARDY, in Andre, Ann. des Epiphyt. Année 19, No. 6, pp. 336, 344, 349, 350, 1933.

Female.—Palpus slender; femur of palpus $1\frac{1}{2}$ times as long as wide, the dorsal seta about as long as the segment; genual seta on posterior margin of segment; palpal claw relatively weak, with 2 basal teeth of equal size; outer comb with 15 teeth, about $1\frac{1}{2}$ times as long as inner comb which has 16 teeth. Rostrum simple, narrow, broadening slightly to rear; peritreme with 9 or 10 segments. Propodosomatic shield rounded anteriorly, widening posteriorly, covering most of the propodosoma, with four pairs of narrow lanceolate pilose marginal setae. Hysterosomal shield small, rounded, with three pairs of marginal setae. Tarsus I, 146μ long; tibia I, 93μ long; tarsal sensory setae about one-fourth as long as tarsus; guard seta simple, one-half as long as sensory seta; small rodlike sensory seta on tibia I. Leg I, 428μ long; leg IV, 400μ long. Length of body 514μ , including rostrum 714μ ; width 371μ .

Male (after Oudemans, 1906).—Similar to female but with two pairs of dorsosubmedian propodosomatic setae and five pairs of marginal setae on posterior shield.

Type habitat.—Unknown.

Type locality.—Austria.

This is a widespread, free-living species recorded from Australia, Holland, India, Portugal, Mexico, Scotland, Yugoslavia, England, Germany, Japan, Colombia, Chile, Madeira, and the United States. In the United States it has been taken from house sparrow, Ithaca, N. Y.; on *Sciurus carolinensis* at Thomasville, Ga.; and from California, Minnesota, and Oregon in warehouses, in grains. The description of the female is based on material from Voorhout, Holland, intercepted at Philadelphia, Pa.

CHEYLETUS HENDERSONI, new species

PLATE 7, FIGURES 17-19

Female.—Femur of palpus $1\frac{1}{2}$ times as long as wide; genual setae located on posterior margin of segment; palpal claw with 3 basal teeth, but 1 specimen with 4 basal teeth on 1 side; outer comb about one-third longer than inner, with about 17 teeth and inner comb with about 24 teeth. Rostrum simple, widening posteriorly. Anterior shield large, covering propodosoma, with four pairs of pilose marginal setae. Posterior shield large and covering most of hysterosoma, narrowing toward rear, with two pairs of marginal setae. Tarsus I, 83μ long; tibia I, 50μ long; tarsus with a short rodlike sensory seta and a longer simple guard seta; short rodlike set on tibia I. Length of body 313μ , including rostrum 446μ ; width 190μ .

Type habitat.—On "mummy."

Type locality.—Arkansas Cave, Ark.

Type.—U. S. N. M. No. 1757.

Female type and three paratypes (two in poor condition) collected on a "mummy" by W. C. Henderson, letter of July 16, 1935.

This mite is similar to *Cheyletus eruditus* (Schrank) but differs in the number of palpal claw teeth, peritreme, dorsal shields, and in the arrangement of the setae on tarsus I.

CHEYLETUS DODDI, new species

PLATE 7, FIGURES 20-22

Female.—Palpal femur $1\frac{1}{2}$ times as long as wide; femoral and genual setae long, pilose; genual seta located on posterior margin of segment; palpal claw with 3 basal teeth, the 2 posterior teeth appear to be a bifurcation of a single large tooth; palpal combs of about equal length and both with about 15 teeth. Rostrum simple, widening toward rear; peritreme composed of small segments. Anterior shield large, covering most of propodosoma, rounded anteriorly and convex posteriorly, with four pairs of long, simple, pilose marginal setae. Hysterosomal shield with rounded corners, narrowing posteriorly, and with two pairs of marginal setae. Tarsus I, 113μ long; tibia I, 73μ long; tarsus I with a rodlike sensory organ of medium length; guard seta simple, about half as long as sensory organ; tibia with a short rodlike sensory seta and several long simple setae. Leg I about 335μ long. Length of body 386μ , including rostrum 500μ ; width 233μ .

Type habitat.—In "feed."

Type locality.—Ithaca, N. Y.

Type.—U.S.N.M. No. 1758.

The female type and three paratypes were collected by C. R. Crosby (letter of September 28, 1922) in feed at Cornell University, Ithaca,

N. Y. Three additional female paratypes were collected by F. O. Dodd at New York, March 1, 1935, when intercepted in quarantine in valones (nuts) originating in Turkey.

This species is similar to *Cheyletus hendersoni*, new species, but differs in having the anterior tooth on the palpal claw smaller, in the relative sizes of the palpal comb and number of teeth, in the shape of the dorsal shields, and in the relative lengths of tarsus I guard setae to the sensory setae.

CHEYLETUS STRENUUS Oudemans

Cheletes cruditus (femina monstrosa) OUDEMANS, Tijdschr. Ent., vol. 46, p. 127, pl. 13, fig. 46, 1904.

Cheletes strenuus OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 161, 1904; Mém. Soc. Zool. France, vol. 19, p. 83, 1906.

Type habitat and type locality.—Unknown.

CHEYLETUS TROUESSARTI Oudemans

Cheyletus trouessarti OUDEMANS, Tijdschr. Nederl. Dierk. Ver., ser. 2, vol. 8, p. xvi, 1903.

Cheletes trouessarti OUDEMANS, Tijdschr. Ent., vol. 46, pp. 129-132, pl. 13, figs. 47-51; Mém. Soc. Zool. France, vol. 19, p. 88, 1906.

Cheyletus macrocherus HARDY, in Andre, Ann. des Epiphyt. Année 19, No. 6, pp. 350, 351, 1933.

Type habitat and type locality.—Unknown.

CHEYLETUS FORTIS Oudemans

PLATE 7, FIGURES 23-25

Cheletes fortis OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 161, 1904; Mém. Soc. Zool. France, vol. 19, pp. 96-99, figs. 22, 23, 1906.

Female.—Large mite with strong palpi. Palpal femur as wide as long; dorsal femoral and genual setae pilose, genual seta on posterior margin of segment; palpal claw with a large single basal flat tooth; outer comb with about 20 teeth; inner comb only two-thirds as long as outer and with about 27 teeth. Rostrum simple, broadening toward rear; peritreme composed of medium-sized segments. Anterior shield large but not covering entire propodosoma, anterior corners broadly rounded, widening to rear and with four pairs of lanceolate serrate marginal setae. Hysterosomal shield small, almost square but narrowing slightly to rear, with three pairs of lanceolate serrate marginal setae. Tarsus I, 150μ long; tibia I, 100μ long; tarsus I with short lanceolate sensory seta and a still shorter simple guard seta; tibia I with a short rodlike sensory seta. Leg I, 460μ long; leg IV, 428μ long. Length of body 500μ , including rostrum 743μ ; width 428μ .

Type host.—On skin of parakeet.

Type locality.—New Guinea (specimen in Muséum d'Histoire Naturelle, Paris).

The description was made from two specimens on one slide with the following data (translation, original in Japanese): "Public Health Department of Formosa, Research Laboratory of Medical Zoology." Two other specimens were collected on *Callosciurus sladeni midas* Thomas at Myitkyina, Burma, August 6, 1945, by members of the United States of America Typhus Commission.

This species is closely related to *Cheyletus malaccensis* Oudemans and may prove to be only a variety.

CHEYLETUS LINSDALEI, new species

PLATE 8, FIGURES 26-29

Female.—Palpi of normal size; palpal femur perhaps slightly longer than wide; femoral and genual setae serrate, the genual seta short, on posterior margin of segment, reaching only to basal part of palpal claw; palpal claw usually with 4 teeth but occasionally one side with 3 teeth; outer palpal comb with about 17 teeth, inner comb with about 22 teeth. Rostrum short, broadening to rear; peritreme with eight pairs of large segments. Propodosomal shield widening to rear with four pairs of marginal setae which are clublike, serrate; on posterior portion of shield at least three pairs of setal bases which probably bore staghornlike setae. Hysterosomal shield broad, narrowing only slightly to rear, with three pairs of clublike, serrate marginal setae and five pairs of dorsomedian setal bases as found on the anterior shield; a pair of clublike setae laterad of anterior corners of posterior shield; body shoulder setae long, simple, serrate. Tarsus I, 83μ long; tibia I, 50μ long; sensory seta on tarsus I short, not much longer than width of base of tarsus; guard seta simple, shorter than sensory seta. Body about 353μ long, including rostrum about 500μ ; width about 140μ .

Type habitat.—On *Citellus beecheyi*.

Type locality.—Monterey, Calif.

Type.—U.S.N.M. No. 1760.

The type female was collected January 28, 1943, and four paratypes were taken December 3 and 4, 1942, on *Citellus beecheyi*, Monterey, Calif., by J. M. Linsdale.

This species differs from others in the arrangement of the teeth on the palpal claw and especially in the type of dorsal body setae.

CHEYLETUS SCHNEIDERI Oudemans

Cheyletus schneideri OUDEMANS, Tijdschr. Nederland. Dierk. Ver., ser. 2, vol. 8, p. xv, 1903; Mém. Soc. Zool. France, vol. 16, p. 16, pl. 2, figs. 52-54, 1904.

Cheletes schneideri OUDEMANS, Mém. Soc. Zool. France, vol. 19, p. 84, 1906.

Type habitat.—Dead leaves.

Type locality.—Italy.

CHEYLETUS TRUX Rodendorf

Cheyletus trux RODENDORF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, pp. 87, 88, figs. 1, 2, 17, 19, 21, 1940.

Type habitat.—Granaries and sheep fodder.

Type locality.—Ivanovo; Agriz, Union of Soviet Socialist Republics.

CHEYLETUS CACAHUAMILPENSIS, new species

PLATE 8, FIGURES 30-34

Female.—Palpi strong; no basal condyle; femur about as long as wide, with a short pilose seta; genual seta pilose, on posterior margin of segment; palpal claw with 2 basal teeth, the proximal tooth about twice as long as the distal with a nearly flat surface; outer palpal comb with about 18 teeth; inner comb two-thirds as long and with 20 teeth. Rostrum of normal size; peritreme composed of eight large segments. Anterior shield covering most of propodosoma; four pairs of long, lanceolate serrate marginal setae; one pair of posterior dorsosubmedian staghornlike setae. Hysterosomal shield with four pairs of marginal setae and one pair of dorsosubmedian staghornlike setae on anterior margin of shield. Genital-anal setae appear simple, although the anal setae may be serrate. Tarsus I, 80μ long; tibia I, 34μ long, tarsus I sensory seta short, rodlike; guard seta pilose, four times as long as sensory seta; tibia I with small clavate seta and short pilose setae. Coxae III with a lanceolate serrate seta. Length of body 267μ , including rostrum 380μ ; width 200μ .

Type habitat.—In bat guano.

Type locality.—Cave of Cacahuamilpa, Guerrero, Mexico.

Type.—In the collection of F. Bonet, Mexico, D. F.

The female type and a nymph were collected December 15, 1939, by F. Bonet.

The setal pattern of the dorsal shields and the tarsus I sensory and guard setae are distinctive.

CHEYLETUS BEAUCHAMPI, new species

PLATE 8, FIGURES 35-38

Female.—Palpi and rostrum of normal size. Palpal femur not much longer than broad; genual seta on posterior margin of segment; tarsal claw with 2 basal teeth, the lower tooth flat, not notched; outer comb with about 17 teeth; inner comb with 29 teeth and almost as long as outer comb. Rostrum gradually widening to rear; peritreme simple, composed of medium-sized segments. Lateral margins of pro-

podosomal shield concave; four pairs of lanceolate serrate marginal setae and a pair of posterior dorsosubmedian staghornlike setae. Shoulder setae simple, pilose. Hysterosomal shield almost square, narrowing slightly to rear, with posterior margin concave; two pairs of lanceolate serrate marginal setae and a pair of posterior dorso-submedian staghornlike setae. Anterior to the posterior plate is a pair of lanceolate serrate setae; posterior to plate two pairs of simple, pilose setae. Anal setae pilose; genital setae simple. Legs short, legs I and IV about 335μ long; tarsus I, 120μ long; tibia I, 67μ long; tarsus I sensory seta only one-half as long as the simple guard seta; tibia I sensory seta lanceolate rather than clavate. Length of body 414μ , including rostrum 586μ ; width 300μ .

Type habitat.—In straw mats.

Type locality.—Portugal, intercepted at Boston, Mass.

Type.—U.S.N.M. No. 1761.

The mite was collected December 11, 1939, by J. T. Beauchamp.

The palpal claws, comb, and hysterosomal shield setae are distinctive.

CHEYLETUS AVERSOR Rodendorf

Cheyletus aversor RODENDORF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, pp. 86-87, figs. 18, 20, 1940.

Type habitat.—Unknown.

Type locality.—Ordzhonikidze, Union of Soviet Socialist Republics.

CHEYLETUS DAVISI, new species

PLATE 8, FIGURES 39-42

Female.—Palpi and rostrum of normal size. Palpal femur not much longer than broad; genual seta on posterior margin of segment: palpal claw with 2 basal teeth, the lower one large and notched; outer comb with 15 teeth, about one-third longer than inner comb which has 20 teeth. Rostrum broadening posteriorly; peritreme composed of medium-sized segments. Propodosomatic shield rounded anteriorly; lateral margins rounded; posterior margin almost straight; four pairs of lanceolate serrate marginal setae; a single pair of posterior dorsosubmedian staghornlike setae. Shoulder setae simple, pilose. Hysterosomal shield almost square, slightly narrowing toward rear, posterior margin straight; three pairs of lanceolate serrate marginal setae and a single pair of submedian staghornlike setae. Two pairs of dorsoposterior pilose setae. Anal setae pilose; two pairs of long, simple, genital setae. Legs short; leg I, 280μ long, not reaching much past palpus; leg IV, 266μ long, reaching past posterior margin of body. Tarsus I, 97μ long; tibia I, 57μ long; tarsus I sensory seta short,

about one-half as long as the simple guard seta; ventral tarsal seta pilose; tibia I sensory seta clavate, short. Length of body 428μ , including rostrum 571μ ; width 314μ .

Type habitat.—In onions.

Type locality.—Italy, intercepted at Boston, Mass.

Type.—U.S.N.M. No. 1762.

A single specimen was collected July 6, 1938, by Davis and Freeman.

The palpal claws and combs distinguish this from the closely related species.

CHEYLETUS RAPAX Oudemans

Cheletes rapax OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 12, p. 84, 1903 (the female of this species is wrongly cited as *Cheletes vorax* Oudemans on p. 84); Mém. Soc. Zool. France, vol. 19, pp. 103–108, figs. 25, 26, 1906.

Type habitat.—On skins of birds and mammals.

Type locality.—Uncertain, believed to be either the Marianas Islands or Colombia.

There is a possibility that this species may be the same as *C. malaccensis* Oudemans.

CHEYLETUS MALACCENSIS Oudemans

PLATE 9, FIGURES 43–49

Cheletes malaccensis OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 12, p. 84, 1904; Mém. Soc. Zool. France, vol. 19, pp. 88–96, figs. 19–21, 1906.

Female.—Strong palpi; a minute ventral condyle between palpal coxa and trochanter; palpal femur longer than wide with dorsal pilose seta; genual seta pilose, on posterior margin of segment; dorsal tibial seta simple but ventral seta pilose; palpal claw with a large flat basal tooth and a smaller single distal tooth as figured; outer palpal comb with 16 teeth; inner comb shorter and with 20 teeth. Rostrum normal; peritreme composed of small segments. Propodosomatic shield relatively small, with rounded corners, four pairs of lanceolate serrate marginal setae. Shoulder setae pilose. Hysterosomal shield rectangular, longer than wide, with three pairs of lanceolate serrate marginal setae. Tarsus I, 146μ long; tibia I, 83μ long; tarsus I with a short lanceolate sensory seta and a simple guard seta of equal length; tibia I with a short rodlike sensory seta and several long pilose setae. Legs I and IV, 428μ long. Coxae III with a pilose seta. Length of body 514μ , including rostrum 714μ ; width 342μ .

Male.—Long, slender palpi; palpal femur about twice as long as wide with serrate seta which is shorter than tarsus; femoral and genual setae as in female; palpal tibia with a simple dorsal seta; palpal claw with a single small basal tooth; outer comb with 12 teeth; inner comb shorter, with 9 or 10 teeth. Gnathosoma deeply notched anteriorly; anterior dorsum of rostrum covered with sharp tubercles; peri-

treme small; that part of rostrum overlying the palpal trochanter has two sharp teeth as figured. Anterior shield relatively large, covering most of propodosoma; four pairs of lanceolate serrate marginal setae; two pairs of dorsosubmedian lanceolate serrate setae. Hysterosomal shield narrowing posteriorly; with four or five pairs of lanceolate serrate marginal setae. Tarsus I, 113μ long; tibia I, 90μ long; tarsus I with a large lanceolate sensory organ and a small simple guard seta; tibia I with a short rodlike sensory seta. Leg I, 428μ long; leg IV, 328μ long. Length of body 400μ , including rostrum 571μ ; width 285μ .

Type habitat.—On bird skin, *Psittinus cyanurus* (= *P. incertus*), probably preying on feather mites.

Type locality.—Malacca, Straits Settlements.

Oudemans (1906) gave the above information on habitat and distribution. The following interception records are available (if taken on plant material the host is not listed): Azores, at New York, N. Y.; Belgium, at Charleston, S. C.; Holland, at Philadelphia, Pa.; Italy, at New York, N. Y.; Portugal, at New Orleans, La.; China, at Hawaii; Japan, at Seattle, Wash.; Java, at Hawaii; Philippine Island, at San Francisco, Calif.; Straits Settlements, at Norfolk, Va.; Malaya, at Hawaii; west coast of Africa, at Philadelphia, Pa.; Barbados, at New York, N. Y.; British Guinea, at New York, N. Y.; Colombia, at New York, N. Y.; Cuba, at Norfolk, Va.; Mexico, at Brownsville, Tex. Material is also on hand from Cuzco, Peru; Barranquilla, Colombia, on *Aracocerus fasciatus* eggs; St. Croix, Virgin Islands, on domestic fowl; Richmond, Va., on *Ephestia elutiella*; Shreveport, La.; Redwing, Minn., on wheat screenings; Dallas, Tex.; Atlanta, Ga., in "powder"; Farrington, Ill.

Cheyletus malaccensis resembles closely *C. rapax* Oudemans, and the differences between them may prove to be a variation within a single species. The fact that there appear to be five pairs of setae on the hysterosomal shield strengthens this belief.

CHEYLETUS AUDAX Oudemans

Cheletes audax OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 162, 1904; Mém. Soc. Zool. France, vol. 19, pp. 99–103, fig. 24, 1906.

Type host.—Skin of "bird."

Type locality.—New Guinea (in Muséum d'Histoire Naturelle, Paris).

CHEYLETUS ALACER Oudemans

Cheletes alacer OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 162, 1904; Mém. Soc. Zool. France, vol. 19, pp. 108–112, fig. 27, 1906.

Type host.—Skin of *Pyrrhura cruentata* (= *Conurus cruentata*).

Type locality.—Colombia (in Muséum d'Histoire Naturelle, Paris).

CHEYLETUS CARNIFEX Zakhvatkin

Cheyletus carnifex ZAKHVATKIN, A short key to the granary mites, 2d ed., p. 30, 1935 (?).—RODENDORF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, pp. 89, 90 figs. 27, 28, 1940.

Type habitat.—Unknown.

Type locality.—Moscow, Union of Soviet Socialist Republics.

CHEYLETUS VENATOR Vitzthum

Cheyletus venator VITZTHUM, Arch. für Naturg., vol. 84A, No. 6, p. 2, figs. 1-3, 1920 (1918).

Type habitat.—In nest of *Kopthortosoma nigrita*, preying on acarids.

Type locality.—German East Africa.

CHEYLETUS RABIOSUS Rodendorf

Cheyletus rabiosus RODENDORF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, p. 86, fig. 14, 1940.

Type habitat.—On wheat.

Type locality.—Kazakh, Union of Soviet Socialist Republics.

CHEYLETUS ACER Oudemans

Cheletes acer OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 162, 1904; Mém. Soc. Zool. France, vol. 19, pp. 112-115, fig. 28, 1906.

Type host.—"Birdskin."

Type locality.—Colombia (in Muséum d'Histoire Naturelle, Paris).

CHEYLETUS FEROX Trouessart

Cheyletus ferox TROUESSART, Bull. Bibl. Sci. Ouest., vol. 2, p. 134, 1889.—OUDEMANS, Mém. Soc. Zool. France, vol. 19, pp. 115-119, fig. 29.

Type host.—Bird skin, *Coracopsis nigra barklyi*.

Type locality.—Ile Praslin, Seychelles (island in Indian Ocean).

CHEYLETUS INTREPIDUS Oudemans

Cheletes intrepidus OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 12, p. 84, 1903; Mém. Soc. Zool. France, vol. 19, pp. 119-122, fig. 30, 1906.

Type host.—Bird skin.

Type locality.—Colombia (in Muséum d'Histoire Naturelle, Paris).

CHEYLETUS VORAX Oudemans

Cheletes vorax OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 12, p. 84, 1903 (by error the female of *rapax* is cited here under the name of *vorax*); Mém. Soc. Zool. France, vol. 19, pp. 122-126, fig. 31, 1906.

Type host.—On bat.

Type locality.—Marianas Islands (in Muséum d'Histoire Naturelle, Paris).

CHEYLETUS FURIBUNDUS Rodendorf

Cheyletus furibundus RODENDORF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, p. 85, fig. 15, 1940.

Type habitat.—Unknown.

Type locality.—Ivanov, Union of Soviet Socialist Republics.

CHEYLETUS PRAEDABUNDUS Kuzin

Cheyletus praedabundus KUZIN, in Rodendorf, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, p. 85, 1940.

Type habitat.—Unknown.

Type locality.—Rostov on Don, Union of Soviet Socialist Republics.

UNCERTAIN SPECIES

CHEYLETUS SAEVUS Oudemans

Cheletes eruditus (Schrank) OUDEMANS, Tijdschr. Ent., vol. 46, p. 123, pl. 12, figs. 34-47, 1904 (protonymph).

Cheletes saevus OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, 161, 1904; Mém. Soc. Zool. France, vol. 19, p. 84, 1906.

Type habitat.—In dust.

Type locality.—Netherlands.

There is the possibility that this may be an immature stage of *Cheyletus eruditus* (Schrank).

CHEYLETUS CLAVISPINUS Banks

Cheyletus clavispinus BANKS, Can. Ent., vol. 34, p. 172, 1902.

Type habitat.—Beneath wings of an *Aradus*.

Type locality.—Indianapolis, Ind.

Inadequately described and not figured. Type not found.

CHEYLETUS PATAGIATUS Nordenskiöld

Cheyletus patagiatus NORDENSKIÖLD, Medd. Soc. Faun. Fenn., vol. 26, p. 37, figured, 1900.

Type habitat.—Unknown.

Type locality.—Finland?

CHEYLETUS BURMITICUS Cockerell

Cheyletus burmiticus COCKERELL, Psyche, vol. 24, p. 41, fig. 2, 1917.

From Burmese amber; inadequately described and figured; palpi similar to those of *Cheyletus eruditus* (Schrank) in length and width of segments.

Cheyletus nigripes Mola (Zool. Anz., vol. 32, p. 43, fig. 3, 1907) is not a mite, but an insect.

Genus CHELETOPHYES Oudemans

Cheletophyes OUDEMANS, Ent. Ber. Nederl. Ver., vol. 4, fasc. 78, p. 101, 1914.

Type, *Cheletophyes vitzthumi* Oudemans (monotypic).

KEY TO THE SPECIES OF CHELETOPHYES

1. Palpal femur about as wide as long----- 2
 Palpal femur longer than broad; palpal setae rodlike, serrate; palpal claw with
 a single tooth----- philippinensis, new species
2. Palpal femur setae squamiform, V-like----- 3
 Palpal femur setae rodlike----- 4
3. Posterior part of rostral shield reticulated; tarsus I sensory seta twice as long
 as guard seta----- hawaiiensis, new species
 Posterior part of rostral shield longitudinally striated; sensory and guard
 setae of tarsus I of same length----- marshalli, new species
4. Hyterosomal shield minute, on rear of abdomen----- vitzthumi Oudemans
 Hyterosomal shield longer than propodosomal shield----- semenovi Kuzin

CHELETOPHYES PHILIPPINENSIS, new species

PLATE 9, FIGURES 50-54

Female.—Medium to large mite with rather thin palpi and medium-sized rostrum. Palpal femur only slightly swollen externally, about one-third longer than wide, dorsal seta rodlike, serrate, lateral ventral seta same; genual seta rodlike, serrate, on posterior margin of segment; palpal tibial setae simple; single tooth or claw on basal half near center; outer comb about one-third longer than inner, outer with about 23 teeth and inner comb with 26-28 teeth. Rostrum with shield as figured; peritreme simple, composed of small segments. Single pair eyes. Dorsal body setae long, rodlike, serrate, propodosomal setae 133-150 μ long and posterior abdominal setae 150 μ long. Propodosomal and hyterosomal shields large, covering entire dorsum of mite, coarsely striated; two pairs of dorsal submedian and four pairs of marginal setae, three pairs near eye and one pair in posterior corner; very long shoulder seta; hyterosoma with six pairs of marginal setae and three pairs of dorsal submedian setae. Legs I and IV long; about 400 μ long, and IV about 413 μ long. Tarsus I with sensory seta about twice as long as the simple guard seta, sensory seta about one-third as long as tarsus; tibia I with usual short sensory seta and four long serrate setae. Length of body 366 μ , including rostrum 520 μ ; width 280 μ .

Type host.—*Pandanus tectorius*.

Type locality.—Bataan, Philippine Islands.

Type.—U.S.N.M. No. 1763.

The type and one female paratype were collected July 26, 1920, by H. L. Sanford; a second slide with additional specimens has the same data.

Palpi and tarsi are distinctive.

The anal-genital region of this mite indicates it to be a female, although the dorsal and the marginal setae are rodlike instead of the staghorn type that normally occurs in females.

CHELETOPHYES HAWAIIENSIS, new species

PLATE 10, FIGURES 55-59

Female.—Rostrum and palpi narrow. Palpal femur swollen on outer margin, dorsal seta rodlike, serrate; dorsolateral setae split as figured; lateral ventral setae rodlike, serrate. There is no dorsal genual seta; the usual number of femoral setae is 4, but in this case there are 5, the extra one appearing to be the dorsolateral seta; tibial setae simple; palpal claw long, slender with 9 basal teeth; inner comb with about 34 teeth, weaker and shorter than outer comb which has about 20 teeth and is not as long as palpal claw. Rostrum covered with shield and patterned as figured; peritreme simple, composed of small segments. Propodosomal and hysterosomal shield of about same length, covering most of body; four pairs of rodlike serrate setae on margin of anterior shield and four pairs of such setae on posterior shield margin; anterior shield with four pairs of dorsal submedian staghorn setae; three pairs of similar setae on shield on hysterosoma. One pair of eyes. Leg I, 433μ long; leg IV, only 266μ long. Tarsus I, although superficially like that of *Cheletomorpha lepidopterorum* in general structure, has minute claws; sensory seta rodlike, about as long as segment, guard seta serrate, one-half as long as sensory seta. Tibia with short rodlike sensory seta and three long serrate setae. Length of body 300μ , including rostrum 413μ ; width 213μ .

Male.—Similar to female generally but differing in the dorsal shields and type and arrangement of the dorsal setae. Anterior shield not covering all of propodosoma, with four pairs of long rodlike serrate marginal setae and three pairs of dorsosubmedian setae which are similar to the marginal setae. Two pairs dorsal shields on hysterosoma, a large anterior pair bearing three pairs of setae, and a small posterior pair with two pairs of shorter setae; a pair of dorsosubmedian setae between the anterior pair of shields and pair of setae behind the posterior pair of shields. Length of leg I, 300μ , leg IV, 180μ . Length of body 300μ , including rostrum 400μ ; width 246μ .

Type habitat.—On tropical fruits (free-living predator), associated with other mites.

Type locality.—Kailua, Oahu, Hawaii.

Type.—U.S.N.M. No. 1764.

The type female was collected from papaya fruits, Kailua, Oahu, Hawaii, March 26, 1941, by W. C. Look. Allotype male and 24 paratype females collected on litchi, Lanapape, Kanai, Hawaii, September 15, 1943, by T. Nishida. Six female paratypes were collected from loquat, Panoa Road, Honolulu, Hawaii, February 23, 1943, by T. Nishida; two from Chinese banana, Wailuku, Maui, Hawaii, August 31, 1943, by Holdaway and six from Hau, Waikiki, Honolulu, Hawaii, July 8, 1943, by W. Storey.

The mouth parts and tarsi I are distinctive.

CHELETOPHYES MARSHALLI, new species

PLATE 10, FIGURES 60-64

Female.—Rostrum and palpi broad. Palpal femur broadly rounded on outer margin; femoral and genual setae as in *C. hawaiiensis*; dorso-median seta broadly lanceolate, serrate, dorsolateral seta broad, serrate, split as figured; ventral lateral seta rodlike, serrate; palpal tibial seta simple; claw strong, with 9 or 10 basal teeth; outer comb with about 24-26 teeth, about twice as long as inner comb which has 35-38 teeth. Rostrum broadening toward rear; shield striated longitudinally; peritreme simple, composed of small segments. Dorsal body shields with transverse tuberculate striations, propodosomal shield longer than hysterosomal, both shields covering body; one pair of eyes; four pairs of long rodlike serrate marginal setae on anterior shield and four pairs of dorsosubmedian staghornlike setae; posterior shield with four pairs of marginal setae and two pairs of dorsosubmedian staghornlike setae; anterior marginal setae about 153μ long, posterior marginal setae about 146μ long. Leg I, 406μ long; tarsus I with rodlike sensory seta and serrate guard seta of same length, both about two-thirds as long as tarsus; tibia I with short rodlike seta and three long serrate and one simple setae. Length 300μ , including rostrum 366μ ; width 220μ .

Type habitat.—Unknown.

Type locality.—Imboden, Ark.

Type.—U.S.N.M. No. 1765.

The single specimen was sent in by Byron C. Marshall, January 14, 1935.

The mouth parts and tarsi are distinctive.

CHELETOPHYES VITZTHUMI Oudemans

Cheletophyes vitzthumi OUDEMANS, Ent. Ber. Nederl. Ver., vol. 4, fasc. 78, pp. 101, 102, 1914; Arch. für Naturg., vol. 81A, No. 5, p. 51, 1915; vol. 84A, No. 6, p. 6, 1920 (1918).

Type habitat.—From *Coptorthosoma caffra* (Hymenoptera).

Type locality.—Willowmore, Cape Colony, Africa.

CHELETOPHYES SEMENOVİ Kuzin

Cheletophyes semenovi KUZIN, in Rodendorf, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, p. 94, 1940.

Type habitat.—On cotton seeds.

Type locality.—Uzbekistan, Union of Soviet Socialist Republics.

Genus EUCHEYLA Berlese

Eucheyla BERLESE (subgenus), Redia, vol. 9, pp. 79, 80, 1913.

Eucheyla Berlese, VITZTHUM, Handbuch der Zoologie, p. 146, 1931.

Type, *Cheyletus* (*Eucheyla*) *loricata* Berlese (monotypic).

KEY TO THE SPECIES OF EUCHEYLA

1. Palpal claw with more than 1 tooth..... 2
 Palpal claw slender, with a single basal tooth; tarsus of palpus with a broadly
 clavate seta..... *loricata* (Berlese)
2. Palpal claw with 8 teeth, body partially reticulate dorsally.
 *panamensis*, new species
- Palpal claw with 5 teeth; entire body reticulate dorsally.
 *whartoni*, new species

EUCHEYLA LORICATA (Berlese)

Cheyletia (*Eucheylya*) *loricata* BERLESE, Redia, vol. 9, pp. 79, 80, pl. 1, fig. 7, 1913.

Type habitat.—Moss.

Type locality.—Italy.

EUCHEYLA PANAMENSIS, new species

PLATE 10, FIGURES 65-68

Female.—Rostrum small. Palpal femur longer than wide, only slightly swollen on outer margin, with two dorsal squamiform serrate setae; apparently no dorsal genual seta; palpal claw short, broad, with teeth along entire margin; outer comb strong, with few teeth; inner comb much weaker and with fine teeth; apparently only one normal sicklelike seta, the other being mildly clavate; sensory rod short and clavate. Rostrum broad, with M-like peritreme composed of narrow segments; at posterior ends of peritreme a pair of tympanlike organs of unknown function. Body covered by shields; dorsal body setae large, squamiform, serrate; four pairs of marginal setae and three pairs of dorsosubmedian setae on anterior shield. Single pair of eyes present. Posterior shield with six pairs of marginal setae and two pairs of dorsosubmedian setae. On each side of body, apparently just beneath skin is a long reticulated area as figured. A single pair of squamiform serrate anal setae; other anal and genital setae simple. Legs short; leg I about 200μ long, leg IV about 266μ long. Tarsus I, 87μ long; tibia I, 30μ long. Tarsus I with a short rodlike sensory seta and a long broadly lanceolate serrate guard seta; ventral tarsal seta serrate. Tibia I with a small rodlike sensory seta, a simple ventral seta, and four long, broadly lanceolate serrate setae. Length of body 366μ , including rostrum 446μ ; width 266μ .

Type habitat.—Among eggs of termites.

Type locality.—Panama.

Type.—U.S.N.M. No. 1766.

The above description is based on a single mite, the type taken from among eggs of termites in Panama, 1923.

The palpal claw and dorsal reticulations are distinctive of this species.

EUCHEYLA WHARTONI, new species

PLATE 11, FIGURES 69-71

Female.—Propodosoma of mite covering rostrum. Palpi short, broad, small, dorsal femoral seta squamiform and lateral ventral seta lanceolate, ventral setae squamiform; dorsal genual seta not seen if present; dorsal tibial seta not seen, ventral seta squamiform; outer palpal comb strong, with about 10 stout teeth; inner palpal comb not as stout and with more teeth. Palpal claw with four large teeth extending almost to tip of claw. Dorsal body surface reticulate; dorsal marginal setae large, squamiform, reticulate, situated on body edge but not on reticulate pattern; shoulder setae similar to marginal setae; no dorsomedian setae seen. A pair of eyes present. Posterior anal setae squamiform; other anal-genital setae simple. Leg I, about 233μ long; tarsus I, 83μ long; tibia I, 33μ long. Leg setae large, broadly squamiform, some quite long; guard seta of tarsus I broad, long, extending to tip of tarsus; sensory seta short, rodlike. Length of body 366μ , width 226μ .

Type habitat.—Unknown.

Type locality.—Birnamwood, Wis.

Type.—U.S.N.M. No. 1767.

The type and two paratypes are mounted with *Cheyletia squamosa* (Degeer); all were collected by I. G. Sanders, date unknown.

The dorsal reticulation and rostrum are distinctive.

Genus CHELETONELLA Womersley

Cheletonella WOMERSLEY, Rec. South Austral. Mus., vol. 7, No. 1, p. 60, 1941.

Type, *Cheletonella vespertilionis* Womersley (monotypic).

KEY TO THE SPECIES OF CHELETONELLA

1. Palpal claw with three basal teeth..... *vespertilionis* Womersley
Palpal claw toothed along entire margin..... *rugosa* (Womersley)

CHELETONELLA VESPERTILIONIS Womersley

Cheletonella vespertilionis WOMERSLEY, Rec. South Austral. Mus., vol. 7, No. 1, pp. 60, 61, fig. 7, 1941.

Type host.—Bat.

Type locality.—Glen Osmond, South Australia.

CHELETONELLA RUGOSA (Womersley), new combination

Cheletophanes rugosa WOMERSLEY, Rec. South Austral. Mus., vol. 7, No. 1, pp. 62, 63, fig. 9, 1941.

Type habitat.—On *Calymmaderus* (Coleoptera).

Type locality.—Brisbane, Queensland, Australia.

Womersley placed this species in the genus *Cheletophanes* since the palpal claw is toothed along the entire margin. It is included here with *Cheletonella* because of the single dorsal shield.

Genus CHELETOMIMUS Oudemans

Cheletomimus OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 163, 1904; vol. 5, fasc. 120, p. 359, 1921.

Type, *Cheletomimus trux* Oudemans = *Cheletes berlesei* Oudemans (monotypic).

CHELETOMIMUS BERLESEI (Oudemans), new combination

PLATE 11, FIGURES 72-75

Cheyletus ornatus CANESTRINI and FANZAGO, Berlese, Acari, Myriapoda et Scorpiones hucusque in Italia, reperta, Prostigmata, fasc. 28, No. 6, 1886. (Misidentified.)

Cheletes berlesei OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 17, p. 154, 1904.

Cheletomimus trux OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 163, 1904.

Cheletomimus ornatus (Berlese) OUDEMANS, Mém. Soc. Zool. France, vol. 19, pp. 136-139, figs. 34, 35, 1906.—VITZTHUM, Die Tierwelt Mitteleuropas, vol. 3, No. 3, p. 55, 1929.—BAKER, Bull. California Dept. Agr., vol. 28, No. 4, p. 273, 1939.

Female.—A small, round mite with a short, broad gnathosoma. Femur of palpus short, broad, rounded externally with a dorsal squamiform serrate seta and a lanceolate serrate ventral seta; genu with a squamiform serrate seta on posterior margin; tibial setae of palpus lanceolate, serrate; palpal claw with 7 basal teeth; outer comb as long as the claw and with 14 teeth; inner comb smaller and with 27 teeth. Rostrum broad, covered with areoli; peritreme composed of simple, strong segments. Propodosomatic shield trapezoidlike with posterior margin convex; single pair of eyes; three pairs of lanceolate serrate marginal setae and four pairs of similar dorsal submedian setae. A pair of longer shoulder setae set in a minute plate as are all the setae which are not on the anterior or posterior shields. Hysterosoma with two small shields, each with a single seta; anterior to shields is a transverse row of four setae; behind the shield a row with two setae; then a row of four, and finally a posterior row of two setae. Two pairs of simple genital setae; three pairs of simple posterodorsal anal setae. Legs short; leg I reaches almost to tip of palpal claw; legs I and IV about 166μ long. Tarsus I with a rodlike sensory seta of medium length and a short guard seta; tibia I with a short clublike sensory seta and two lanceolate setae. Femur of leg I with lanceolate serrate dorsal seta; other leg setae lanceolate, serrate; those on tibia I of equal length. Body 313μ long, including rostrum 420μ ; width 260μ .

Type habitat.—Plants.

Type locality.—Italy.

Two specimens, a female and a nymph, of this European species were found in the leaf bud of fig (*Ficus carica*) at Berkeley, Calif., November 17, 1936, associated with the fig mite, *Aceria ficus* (Cotte); collector, E. W. Baker. A single specimen, which is deposited in the British Museum, was found among mites collected on citrus "branches-leaves," Beit-Hanun (Gaza), Palestine, "4-2-46," by P. Jolles.

EUCHEYLETIA, new genus

Palpal tarsus with two sicklelike and two comblike setae; marginal setae of dorsal shields scalelike; dorsomedian setae cloudlike; two dorsal shields; all tarsi with claws; and without a pair of lenslike eyes on anterior shield. This last character and the presence of the cloudlike dorsomedian setae separate this genus from *Cheyletia* Haller.

Type, *Eucheyletia bishoppi*, new species.

KEY TO THE SPECIES OF EUCHEYLETIA

1. Palpal claw with 2 basal teeth, guard seta on tarsus I simple----- 2
 Palpal claw with 3 basal teeth, guard seta on tarsus I pilose, about 3 times
 as long as sensory seta; 5 pairs of marginal setae on posterior dorsal
 shield----- harpyia (Rodendorf)
2. Posterior anal setae squamiform serrate----- 3
 All anal-genital setae simple----- hardyi, new species
3. Three pairs of marginal setae on posterior dorsal shield flabellifera (Michael)
 Five or six pairs of marginal setae on posterior dorsal shield.
 bishoppi, new species

EUCHEYLETIA HARPYIA (Rodendorf), new combination

PLATE 11, FIGURES 76-79

Cheyletia harpyia RODENDORF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, pp. 90-92, figs. 8, 29, 30, 1940.

Female.—Palpi strong; femur as long as wide, swollen on outer side and straight on inner side, dorsal seta long, squamiform serrate, ventral palpal setae shorter and narrower than dorsal seta; broad squamiform serrate seta on posterior margin of genu; palpal claw thin and pointed, with 3 basal teeth; outer comb longer than claw, with 17 or 18 teeth; inner comb only slightly curved, with many fine, short teeth. Rostrum of medium size with an irregular dorsal reticulate design; peritreme simple, composed of small segments. Propodosomatic shield wider than long, with four pairs of lateral squamiform setae; five pairs of dorsal submedian cloudlike setae as figured; no eyes. Hysterosomal shield wider than long, tapering posteriorly, with five pairs of lateral squamiform serrate setae and six pairs of dorsol submedian cloudlike setae. Three pairs anal bristles, the posterior pair squamiform serrate, the other anal and genital bristles simple. Tarsus I, 123μ long; tibia I, 53μ long; tarsal hairs on tip 113 and 77μ long, respectively; sensory rod short; guard (?) seta very long, serrate; long simple ven-

tral seta. Tibia I with a short rodlike sensory seta and four strongly lanceolate serrate setae. Length of body 366μ , including rostrum 500μ ; width 300μ .

Male.—As figured and described by Rodendorf, with four pairs of squamiform marginal setae and three pairs of submedian setae on propodosomatic shield; hysterosomal shield with three pairs of marginal and two pairs of submedian setae.

Type habitat.—Storehouses.

Type locality.—Ivanovo; Agriz, Union of Soviet Socialist Republics.

The description of the female was taken from three specimens collected in *Bombus* nest, Beaver Mountains, Alaska, March 1, 1942, by C. A. Fowler. The peculiar cloudlike setae of the female were apparently overlooked in the original description, and only the setal stems were seen and mentioned as being short, asymmetrical.

EUCHEYLETIA FLABELLIFERA (Michael), new combination

Cheyletus flabellifer MICHAEL, Trans. Roy. Micr. Soc., vol. 1, p. 135, 1878.

Cheyletus (Cheyletia) flabellifer Michael, BERLESE, Acari, Myriapoda et Scorpiones hucusque in Italia reperta, Prostigmata, p. 74, 1893.

Cheletia flabellifera (Michael) Oudemans, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 162, 1904; Mém. Soc. Zool. France, vol. 19, pp. 127–136, fig. 33, 1906.

According to Oudemans' (1906) redescription of this species it is in general like *bishoppi*, new species, but is differentiated in having a simple ventral seta on the genu of palpus, in having smaller shields, in having fewer marginal setae on posterior shield in that the anal squamiform setae are longer than the simple setae, and in having simple ventral setae on the tibia of the third pair of legs.

Type habitat.—Dust of caves.

Type locality.—England.

EUCHEYLETIA BISHOPPI, new species

PLATE 11, FIGURES 80–82; PLATE 12, FIGURES 83–88

Female.—Medium-sized mite, small palpi. Palpal femur strongly swollen on outer side and concave on inner side; dorsal palpal setae squamiform serrate; genual seta on posterior margin of segment; genu of palpus with ventral lanceolate serrate seta; palpal claw with 2 long, narrow teeth; outer comb about as long as claw, with about 15 teeth; inner comb about one-half as long as outer and with about 24 teeth. Rostrum of medium size, gradually widening posteriorly, with a few longitudinal sculpturings. Peritreme composed of short, fairly strong segments. Propodosomatic shield wider than long, anterior corners rounded; four pairs of marginal squamiform serrate setae; seven pairs of cloudlike dorsal submedian setae as figured. No eyes. Hysterosomal shield with five or six pairs of marginal squamiform serrate

and eight pairs of dorsosubmedian cloudlike setae (the anterior lateral setae may or may not be on edge of shield); shield about as wide as long, narrowing to rear which is rounded. Three pairs of anal bristles, the posterior pair squamiform serrate, other anal and genital setae simple. Leg I about 300μ long; IV, 266μ long. Tarsus I, 127μ long; tibia I, 57μ long; all tarsal setae simple, not squamiform; dorsally a long rodlike sensory seta; guard seta slightly longer than sensory seta; tibia I with three squamiform setae and a short, curved clublike sensory seta. Tibia III with two dorsal squamiform serrate setae, and ventrally a lanceolate serrate seta and a simple seta. Length of body 513μ , length including rostrum 680μ ; width about 380μ .

Male.—Palpi long, slender; palpal femur $2\frac{1}{2}$ times as long as broad, the dorsal seta squamiform; genu with a squamiform dorsal and a slightly broadened ventral seta; femoral and genual setae as in female; palpal claw with a single small basal tooth; outer comb with about 19 teeth; inner comb with about 22 teeth. Rostrum long, narrow, with a few longitudinal markings; peritreme composed of seven pairs small segments. Propodosoma entirely covered by shield, with four pairs of marginal and three pairs of dorsal submedian squamiform serrate setae. Shield covering all of hysterosoma; shield with four pairs of marginal and two pairs of dorsal submedian squamiform serrate setae. Genital opening on posterior-rear. Tarsus I, 116μ long; tibia I, 90μ long. Tarsus I sensory seta long, extending past tip of tarsus; guard seta simple, less than one-half as long as sensory seta. Tibia I with lanceolate serrate setae. Length of body 307μ , including rostrum 513μ ; width about 266μ .

Type host.—*Neotoma fuscipes* (occupied nest).

Type locality.—Monterey, Calif.

Type.—U.S.N.M. No. 1768.

The female type and a male were collected from an occupied nest of *Neotoma fuscipes*, February 14, 1946, and a female paratype was collected on *N. fuscipes*, March 16, 1946, at Monterey, Calif., by J. M. Linsdale. Two females were collected on pine mouse, College Park, Md., June 14, 1933, by F. C. Bishopp, and another female was collected on pine mouse, Burnt Mills, Md., March 29, 1932, by R. Greenfield.

The peritreme, palpi, and setal arrangement on the dorsal posterior plate and type of setae on tibia III distinguish this species from *Eucheyletia flabellifera* (Michael).

EUCHEYLETIA HARDYI, new species

PLATE 16, FIGURES 140-144

Female.—Palpi and rostrum somewhat large in proportion to body. Palpal femur strongly swollen on outer side; dorsal palpal femoral

seta squamiform serrate; dorsal genual setae squamiform serrate, on posterior margin of segment; ventral seta simple; lateral seta of femur absent; palpal claw stout with 2 large teeth, the basal tooth broader and shorter than the distal tooth; outer comb with approximately 17 teeth; inner comb with approximately 35 teeth. Rostrum of medium size, with a few tubercles. Peritreme composed of six pairs of short, fairly strong segments. Propodosomatic shield wider than long; four pairs of marginal squamiform serrate setae; only three pairs of cloudlike dorsal submedian setae discernible, all such setae with convolutions. No eyes. Hysterosoma shield with two pairs of marginal squamiform serrate and three pairs of dorsosubmedian cloudlike setae; shield wider than long, narrowing to rear. All anal-genital setae simple. Leg I about 330μ long; IV, 300μ . Tarsus I, 116μ long; tibia I, 57μ long; no squamiform setae present on tarsus I; dorsally a short rodlike sensory seta; guard seta simple and about twice as long as sensory seta; ventral seta only slightly serrate; tibia I with a very short clublike sensory seta and three squamiform serrate setae, as well as a setae base with seta missing. Tibia III with two dorsal squamiform serrate setae, and ventrally a similar seta as well as a simple seta. Length of body about 430μ , including rostrum 585μ ; width about 328μ .

Type habitat.—In *Neotoma micropus* nest.

Type locality.—Harlingen, Tex.

Type.—U. S. N. M. No. 1769.

The single specimen, the female type, was collected August 22, 1945, by Hardy and Wooley.

This species differs from *E. bishoppi* in having two instead of six pairs of setae on the margin of the hysterosomal shield, in the number of cloudlike setae, and in having all simple genital-anal setae.

Genus CHEYLETIA Haller

Cheyletia HALLER, Arch. für Naturg., vol. 1, pp. 233, 234, 1884.

Cheletia Haller, OUDEMANS, Mém. Soc. Zool. France, vol. 19, p. 126, 1906.

Type, *Cheyletus laureata* Haller=*Acarus squamosus* Degeer (according to Oudemans, 1897) (monotypic).

KEY TO THE SPECIES OF CHEYLETIA

1. Dorsal palpal femoral setae strong, but no more than lanceolate serrate in form..... 2
- Dorsal palpal femoral setae squamiform..... 3
2. Palpal claw with 10-12 teeth; dorsum of rostrum with tuberculate shield; dorsal body setae squamiform..... pyriformis (Banks)
- Palpal claw with 9 or 10 teeth; dorsum of rostrum with few tubercles and a reticulate pattern; dorsal body setae long and broadly lanceolate.
virginiensis, new species

3. Palpal claw with 8 teeth; palpal tibial seta lanceolate serrate; inner palpal femoral seta squamiform; dorsal setae of tibia I of leg short, squamiform; ventral seta simple; dorsomedian setae of body appear staghornlike or squamiform----- *wellsi*, new species

Palpal claw with 5 teeth; palpal tibial seta large, squamiform; inner palpal femoral seta squamiform-split; dorsal and ventral setae of tibia I of leg long, broadly lanceolate; serrate; dorsomedian body setae not known.

squamosa (Degeer)

CHEYLETIA PYRIFORMIS (Banks), new combination

PLATE 12, FIGURES 89-94

Cheyletus pyriformis BANKS, Proc. U. S. Nat. Mus., vol. 28, pp. 17, 19, fig. 17, 1904; Proc. Ent. Soc. Washington, vol. 7, p. 135, 1906.

Cheletia flabellifera (Michael), male of Oudemans, Mém. Soc. Zool. France, vol. 19, pp. 127-146, fig. 32, 1906. (Misidentification.)

Cheyletus longipalpus EWING, Trans. St. Louis Acad. Sci., vol. 18, p. 54, pl. 7, fig. 1, 1909 (new synonymy).

Female.—Rostrum long, narrow. Femur of palpus swollen laterally, with a dorsal strongly lanceolate serrate seta; genual seta lanceolate serrate, on posterior margin of segment; other setae simple; palpal claw with 12 teeth; palpal combs of about equal length, outer comb with 17 teeth, inner comb with about 24 teeth; tarsal sensory seta of palpus strongly clavate. Tuberculate shield covering posterior portion of rostrum; peritreme simple, composed of narrow segments. Propodosomatic shield tuberculate; wider than long; with a single pair of eyes; with four pairs of squamiform serrate marginal setae and five pairs of dorsosubmedian staghornlike setae. Hysterosomal shield tuberculate, as long as wide, with five pairs of squamiform serrate marginal setae and four pairs of dorsosubmedian staghornlike setae. Genital region not seen. Tarsus I, 60μ long; tibia I, 50μ long; tarsus I with minute claws, almost invisible under low power; sensory rod long, more than one-half as long as tarsus; tibia with a small clavate sensory organ and two dorsal squamiform serrate setae. Length of body 353μ , including rostrum 466μ ; width 246μ .

Male.—Palpi, rostrum long, narrow. Femur of palpus long, narrow, with almost parallel sides, distally and dorsally with a long narrow tubercle bearing a strong lanceolate serrate seta; genu with a smaller similar seta but not arising from tubercle, on posterior margin of segments, other setae simple; palpal claw with 8 basal teeth; outer palpal comb with about 17 teeth; inner combs with about 24 teeth; palpal tarsal sensory seta clavate. Rostrum covered with tuberculate shield. Body shields tuberculate; anterior shield with a single pair of eyes, four pairs of squamiform serrate marginal setae and three pairs of similar dorsosubmedian setae. Posterior shield with three pairs of marginal setae and two pairs of dorsosubmedian setae. Genital area not seen. Leg I, 333μ long; tarsus I, 73μ long;

tibia I, 110μ long; tarsus I with minute claws and a long rodlike sensory organ more than one-half as long as tarsus; tibia I with long clavate sensory seta and one large and two small lanceolate serrate setae. Claws on legs II, III, and IV normal as in female. Length of body 266μ , including rostrum 380μ ; width 166μ .

Type habitat.—Associated with grapevine scale.

Type locality.—Kirkwood, Mo.

The mite was first named and figured by Banks in 1904 and described in 1906. In his 1906 description Banks stated that the mites were collected from grapevine scale (*Aspidiotus urae*) by Professor Webster at Lafayette, Ind., in December. However, in checking over the original notes made by Pergande it was found that the mites were sent in by Miss Murtfeldt from Kirkwood, Mo., in December 1888, from grapevine scale. These mites were of both sexes. Other specimens examined were Ewing's type, male, which was taken under log, Urbana, Ill., July 1, 1908, by H. E. Ewing; male and female specimens on slide without data; males from gall on sycamore branches, Jacksonville, Ill., March 1926; a female collected in rice straw from India by Lennox and Rosanoff at New York, December 15, 1944; and a male and a nymph collected in 1947 at Mount Holyoke College, South Hadley, Mass., by Alice Deardorff.

CHEYLETIA VIRGINIENSIS, new species

PLATE 13, FIGURES 95-98

Female.—Medium-sized mite. Palpi only slightly swollen; palpal femur about as long as broad, rounded laterally, with 2 dorsal lanceolate serrate setae, one near anterior margin; the outer ventral setae smaller and lanceolate serrate; no dorsal seta on genu; palpal claw with 9 basal teeth; outer combs shorter than claw, with 29 teeth; inner comb shorter than outer with at least twice as many teeth. Rostrum normal; tuberculate dorsally with a slight reticulate pattern, peritreme simple, composed of slender segments. Propodosomatic shield wider than long, with rounded corners; a single pair of eyes; four pairs of lanceolate serrate marginal setae; five pairs of dorsosubmedian staghornlike setae. Hysterosomal shield wider than long, rounded posteriorly, with five pairs of lanceolate serrate marginal setae and four pairs of dorsosubmedian staghornlike setae. Areas around anterior and posterior shields striated-tuberculated, the tubercles being very large. Genital area normal, all setae simple. Leg I, 643μ long; leg IV, 428μ long. Tarsus I, 166μ long; tibia I, 150μ long; tarsus I with a rodlike sensory seta which is punctate on basal half and more than one-half as long as tarsus; tibia I with a short rodlike sensory organ and four long serrate setae and one simple seta. Length of body 455μ , including rostrum 655μ ; width about 350μ .

Type habitat.—Associated with *Dendroctonus frontalis* Zimmermann.

Type locality.—Gloucester County, Va.

Type.—U.S.N.M. No. 1770.

Described from a single female collected by L. A. Hetrick, May 1939.

The palpi, dorsal setae, and tarsal tibial setae arrangement are distinctive for this species.

CHEYLETIA WELLSI, new species

PLATE 13, FIGURES 99-102

Female.—Small mite. Palpi short, thick; palpal femur wider than long, swollen, with small dorsal tubercles and squamiform dorsal seta; genu with similar seta on posterior margin of segment; seta on palpal tibia narrow, slightly spined; claw with 6-8 teeth; outer comb as long as claw with about 15 teeth; inner comb shorter and with about 20 teeth. Rostrum covered with tuberculate shield; peritreme composed of medium-sized segments; posterior of rostrum without tubercles, striated. Anterior shield trapezoidlike, covering most of propodosoma, corners rounded, with four pairs of squamiform serrate marginal setae and five pairs of dorsosubmedian staghornlike setae. A single pair of eyes on edge of shield. Hysterosomal shield narrowing rapidly toward rear, corners broadly rounded, with four pairs of squamiform serrate marginal setae and two pairs of dorsosubmedian staghornlike setae; a single pair of squamiform serrate setae near anterior corners of shield. Genital setae simple; anal setae serrate. Tarsus I, 76μ long; tibia I, 30μ long; tarsus with a simple sensory organ more than one-half as long as tarsus; guard seta not seen but probably short, fine, and simple; tibia with a large dorsal squamiform serrate seta and a small clavate sense organ. Legs I and IV short, about 186μ long. Length of body 253μ , including rostrum 363μ ; width 200μ .

Type habitat.—On navel orange.

Type locality.—Azores, intercepted at Philadelphia, Pa.

Type.—U.S.N.M. No. 1771.

The female type was collected from navel orange, Azores, intercepted at Philadelphia, Pa., February 9, 1945, by A. B. Wells, for whom the mite is named. Other specimens were collected as follows: On *Hibiscus* leaf, Mexico, at Hidalgo, Tex., May 1, 1936, by F. E. Swan and A. L. Williamson; on *Saccharum officinarum*, Mayagüez, Puerto Rico, April 29, 1942, by H. K. Plank; on *Ananas* sp., Canal Zone, at Hawaii, July 16, 1936, by Uyeda; on *Lantana camara*, St. Augustine, Trinidad, British West Indies, May 28, 1937, by R. G. Fennah; on pineapple leaf, Cuba, at New York, May 18, 1936, by

Woodbury; on pineapple leaves, Jamaica, at Portland, Oreg., June 8, 1936, by L. M. Scott; and free-living in Takabannare Shima, an island off Okinawa, June 17, 1945, by A. B. Hardeastle.

These mites show variation in the number of dorsomedian propodosomal setae. This variation ranges from one pair in the Okinawa specimen to five pairs in the type specimen. However, of two specimens from Puerto Rico, one has one pair of setae and the other has two pairs, and of the two specimens from Mexico, one has three pairs and the other has four pairs of setae.

The species is distinctive in the number of palpal claw teeth, and in the type of the setae. The specimen from Jamaica possesses dorsal propodosomal setae which are normally squamiform, not staghorn-like. This would indicate that the staghornlike structure is an artifact, probably due to mounting technique. This may be true of the other types of setae found.

CHEYLETIA SQUAMOSA (Degeer)

PLATE 13, FIGURES 103-105

Acarus squamosus DEGEER, Mémoires pour servir à l'histoire des insectes, vol. 7, p. 116, pl. 7, fig. 4, 1778.

Cheyletia laurcata HALLER, Arch. für Naturg., vol. 1, pp. 234, 235, pl. 16, fig. 9, 1884.—KARPELLES, Math. Naturw. Ber. Ungarn., vol. 11, p. 124, pls. 18, 19, figs. 3, 6, 6a, 1893.

Cheyletus squamosa (Degeer) OUDEMANS, Tijdschr. Ent., vol. 40, pp. 126-135, pl. 5, 1897.—VITZTHUM, Die Tierwelt Mitteleuropas, vol. 3, No. 3, p. 55, 1929.—RODENDORF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, p. 90, 1940.

Cheletia squamosa (Degeer) OUDEMANS, Mém. Soc. Zool. France, vol. 19, pp. 126, 127, 1906.

Female.—Small mite. Femur of palpus strongly elbowed on outer side, with two dorsal squamiform serrate setae, the inner seta split; genual seta similar and covering most of claw, located on anterior portion of genu; a ventral lanceolate serrate seta present; palpal claw with only five basal teeth; outer comb strong, as long as claw, inner comb about three-fourths as long as claw; sickle setae two in number, normal; rodlike sensory seta on palpal tarsus. Rostrum stout, peritreme simple. Body of mite covered by two shields; no dorsosubmedian setae but several setal bases located; one pair of lateral eyes; four pairs of squamiform serrate setae on anterior shield and six pairs on posterior shield. A pair of squamiform anal bristles, other anal and genital setae simple. Legs short; leg setae, except those on tibiae and tarsi, broadly squamiform; those on tibiae-tarsi broadly lanceolate serrate. Tarsus I, 63μ long; tibia I, 29μ long; tarsus I with a short rodlike sensory seta. Length of body 280μ , including rostrum 366μ ; width 213μ .

Type habitat.—Associated with scale insects.

Type locality.—France.

Specimens examined were collected at Birnamwood, Wis., May 14 (?), by I. G. Sanders.

These mites check almost perfectly with the figures given by Oudemans (1897), whose interpretation is being followed.

Genus CHELETOMORPHA Oudemans

Cheletomorpha OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 162, 1904.

Type, *Acarus lepidopterorum* Shaw, 1794 (= *Cheyletus venustissima* Koch, 1839) (synonymy of Oudemans, 1937) (monotypic).

CHELETOMORPHA LEPIDOPTERORUM (Shaw)

PLATE 13, FIGURES 106, 107; PLATE 14, FIGURES 108-112

Acarus lepidopterorum SHAW, Nat. Misc., vol. 6, pl. 187, 1794.

Cheyletus venustissimus KOCH, Deutschlands Crustaceen, Myriapoden und Arachniden, fasc. 23, fig. 22, 1839.

Cheyletus semivivorus PACKARD, A guide to the study of insects, p. 665, 1869.

Cheyletus longipes MEGNIN, Journ. Anat. and Physiol., 1878, p. 8.—BANKS, Proc. Ent. Soc. Washington, vol. 11, p. 133, fig. 9, 1909 (new synonymy).

Cheletomorpha venustissima (Koch) OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 162, 1904; Mém. Soc. Zool. France, vol. 19, pp. 144-153, figs. 37-39, 1906.—CHERIAN, Journ. Asiatic Soc. Bengal, new ser., vol. 27, No. 1, p. 145, 1932 (1931).—ROBENLOFF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, p. 92, 1940.—WOMERSLEY, Rec. South Austral. Mus., vol. 7, No. 1, p. 62, 1941.

Cheyletus rufus HARDY, in Andre, Ann. des Épiphyt. Année 19, No. 6, p. 352, 1933.

Cheletomorpha lepidopterorum (Shaw), OUDEMANS, Kritisch Historisch Overzicht der Acarologie IIIc, pp. 1115-1117, 1937.

Female.—Long-legged mite with long body and leg setae which are serrate, rodlike, and slightly flattened on end. Palpal femur strongly swollen externally and straight internally, with 3 long, rodlike, serrate setae and 2 single ventral setae; no dorsal seta on genu; other palpal setae simple; palpal claw long, slender, with a single basal tooth; outer comb about as long as claw, with approximately 24 teeth; inner comb shorter and with perhaps twice as many teeth. Rostrum long, narrow, sides concave; covered with a simple shield. Peritreme simple, of small segments. Propodosomatic shield slightly wider than long, with broadly rounded corners, three pairs of long, serrate rodlike marginal setae near eye and one pair on posterior corner; two pairs of dorsal submedian short simple setae; a pair of long serrate rodlike shoulder setae. Hysterosomal shield wider than long, rounded posteriorly, with two pairs of lateral marginal anterior setae and three pairs of posterior marginal setae, as well as two pairs of short simple dorsal submedian setae; a pair of long setae on posterior edge of abdomen. Leg I, 670 μ long; IV, 457 μ long; legs II and III shorter. Tarsus, 106 μ long; tibia I, 166 μ long; tarsus I sensory seta short, rodlike, with a serrate guard seta of about three

times the length of the sensory; sensory seta on tibia 1 very short. Tarsus I lacking claws but with pulvillus. Length of body 500μ , including rostrum 643μ ; width 340μ .

Male.—Similar to female; palpal claw with two or three smaller teeth; femoral and genual setae rodlike, serrate, and in normal position; body setae longer than in female; dorsal submedian setae short, spatulate, and serrate; tarsus I sensory seta about one-half as long as guard seta. Length of body 314μ , including rostrum 428μ ; width 228μ .

Type habitat.—Moth wing.

Type locality.—England.

These mites are found on various importations from all parts of the world and are one of the most striking of the cheyletids. The description of the female is based on material collected on cauliflower leaf, "British," at Boston, Mass., October 24, 1937, by J. T. Beauchamp; and the description of the male was taken from a specimen collected in straw packing, Spain, at St. Louis, Mo., March 24, 1944 (no collector's name given). Other United States National Museum records are England, France, Holland, Italy, Portugal, Australia, Java, Philippines, Japan, China, India, Mexico; and in the United States, Texas, Virginia, Maryland, and California.

CHELETOMORPHA ORIENTALIS Oudemans

Cheletomorpha orientalis OUDEMANS, Ent. Ber. Nederl. Ver., vol. 7, fasc. 162, p. 343, 1928.

The species supposedly differs from *C. lepidopterorum* in having eyes located near the shield, not on it, and in having rodlike setae instead of the somewhat flattened ones. Possibly a synonym of *C. lepidopterorum*. Not seen.

Type habitat.—On leaves of an orchid, *Phalaenopsis* sp.

Type locality.—Java.

Genus CHELETOPHANES Oudemans

Cheletophanes OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 162, 1904.

Type, *Cheyletus montandoni* Berlese and Trouessart (monotypic).

KEY TO SPECIES OF CHELETOPHANES

1. Palpal claw with 13 teeth; dorsal body striations forming concentric rings----- *montandoni* (Berlese and Trouessart)
Palpal claw with 10 teeth; dorsal body surface rugose----- *peregrinus* Berlese

CHELETOPHANES MONTANDONI (Berlese and Trouessart)

Cheyletus montandoni BERLESE and TROUESSART, Bull. Bibl. Sci. Ouest., vol. 2, p. 133, 1889.

Cheletophanes montandoni (Berlese and Trouessart) Oudemans, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 162, 1904; Mém. Soc. Zool. France, vol. 19, pp. 140-144, fig. 36, 1906.

Type habitat.—Taken on elytra of *Aradus varius*.

Type locality.—"Brostenii (Valache de Nord)." The town of Brosteni in northern Rumania is evidently this locality.

CHELETOPHANES PEREGRINUS Berlese

Cheletophanes peregrinus BERLESE, Redia, vol. 14, p. 194, 1921.

Type habitat.—Rotten bark on ground.

Type locality.—Florence, Italy.

EUTOGENES, new genus

Tarsus I lacks claws and pulvillus. No eyes. Two dorsal shields, dorsal setae squamiform serrate, with two comblike and two sicklelike setae on palpal tarsus.

This genus is similar to *Cheletogenes* in lacking tarsal I claws and pulvillus, but differs in not having the lenslike eyes.

Type, *Eutogenes foxi*, new species.

EUTOGENES FOXI, new species

PLATE 14, FIGURE 113-116

Female.—A small mite. Palpal femur with few dorsal tubercles; dorsal setae of femur and genu broad, serrate; genual seta on posterior margin of segment; other palpal setae simple; no teeth on palpal claw. Few tubercles or dorsum of rostrum; peritreme simple, composed of four segments. Propodosomal shield without eyes; 12 pairs of squamiform serrate setae on shield; 12 pairs of similar setae on hysterosomal shield. Genital-anal setae simple. Tip of tarsus I with two very long and a slightly shorter seta; approximate and anterior to sensory seta is a long seta; sensory seta rodlike, about as long as tarsus. Tibia I with lanceolate serrate setae. Tarsus I, 36.6μ long; tibia I, 60μ long. Squamiform serrate setae on coxa, femur, genu, and tibia of all legs. Length of body 253μ , including rostrum 316μ ; width about 200μ .

Type habitat.—On rose stems.

Type locality.—Brownsville, Tex.

Type.—U.S.N.M. No. 1772.

The type female, a paratype, and nymph were collected on rose stem, originating in Mexico, at Brownsville, Tex., December 27, 1946, by Edgeworth. Another specimen was collected on rat at Camp O'Reilly, Puerto Rico, September 7, 1945, by Irving Fox, and is in the collection at the School of Tropical Medicine, San Juan, Puerto Rico.

Genus CHELETOGENES Oudemans

Cheletogenes OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 21, p. 208, 1905.

Type, *Cheyletus ornatus* Canestrini and Fanzago (monotypic).

KEY TO THE SPECIES OF CHELETOGENES

1. Palpal claw with teeth..... 2
 Palpal claw without teeth..... quadrisetosus Berlese
2. Palpal claw not toothed along entire inner margin; rostral pattern of areoli or tubercles..... 3
 Palpal claw with teeth along entire edge; rostral shield pattern of striations..... ornatus (Canestrini and Fanzago)
3. Palpal femoral setae broadly clavate or squamiform; palpal tibial setae broadly clavate..... 4
 Palpal femoral setae strong, serrate, but not squamiform; palpal tibial setae simple; gnathosoma with areoli only..... buckneri, new species
4. Dorsal shields with areoli; palpal femur about as long as wide.
 oaklandia, new species
 Dorsal shields punctate and with large tubercles; palpal femur longer than wide..... traubi, new species

CHELETOGENES QUADRISSETOSUS Berlese

Cheletogenes quadrisetosus BERLESE, Redia, vol. 9, p. 79, pl. 1, fig. 6, 1913.

Type habitat.—Not given.

Type locality.—Java.

In the figure by Berlese the single pair of eyes are located dorsally, far in from the margin, and not in the usual marginal position between the second and third pair of setae.

CHELETOGENES ORNATUS (Canestrini and Fanzago)

PLATE 14, FIGURES 117–119

Cheyletus ornatus CANESTRINI and FANZAGO, Att. Soc. Veneto-Trentina, 1876, p. 106.

Cheyletus saccardianus BERLESE, Acari, Myriapoda et Scorpiones hucusque in Italia, Prostigmata, fasc. 32, No. 2, 1886.

Cheletia ornatus (Canestrini and Fanzago) OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 154, 1904.

Cheletogenes ornatus (Canestrini and Fanzago) OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 21, p. 208, 1905; Mém. Soc. Zool. France, vol. 19, pp. 153–159, figs. 40, 41, 1906.—WOMERSLEY, Trans. Roy. Soc. South Australia, vol. 66, No. 1, p. 85, fig. 2, 1942—McGREGOR, California Citrograph, vol. 30, No. 2, p. 53, illus., 1944.

Cheyletus cocciphilus BANKS, Journ. Ent. and Zool., vol. 6, p. 56, fig. 10, 1914 (new synonymy).

Female.—A small round mite with short broad rostrum and palpi. Femur of palpus strongly swollen on outer margin; femoral and genual setae squamiform, serrate; genual seta on posterior margin of segment; palpal claw of medium size, curved, with many teeth along entire inner margin; outer comb about same length as claw, stout; inner comb about same length as outer but finer; both combs with

many teeth. Rostrum broad, covered with a peculiar striated shield as figured; peritreme composed of sausagelike segments. Anterior shield covering most of propodosoma, covered with large rounded tubercles. Single pair of eyes; four pairs of squamiform serrate marginal setae and three pairs of similar dorsal submedian setae; single pair of shoulder setae. Hysterosomal shield not touching anterior shield, small, covering about one-half of anterior part of hysterosoma; tuberculate, with one pair of anteriomarginal setae and one pair of dorsal submedian setae. Three pairs of setae off lateral margin of shield on hysterosoma and four pairs behind shield; hysterosoma with sinuous irregular striations. Anal and genital setae simple. Legs short, I and IV about 133μ long. Tarsus I, 23μ long; tibia I, 36.5μ long; tarsus I with two long terminal setae and a short rodlike sensory seta which is about one-half as long as tarsus; tibia I with a short minute clavate sensory seta and four squamiform serrate setae. Length of body 246μ , including rostrum 320μ ; width about 213μ .

Male.—Similar to female but with large rodlike sensory setae on tarsi III and IV. Length of body 167μ , including rostrum 213μ ; width 120μ .

Type habitat.—On plants.

Type locality.—Italy.

The above description is based on specimens collected by A. M. Boyce in lemon buds with *Aceria sheldoni* (Ewing) at Santa Paula, Calif., July 30, 1937. United States National Museum records are Italy, China, Hawaiian Islands, West Indies, and Florida, Louisiana, and California in the United States. Womersley (1942) records it from Australia. It is usually found associated with scale insects or with eriophyid mites on which it preys, and McGregor has reported it predaceous on *Tarsonemus bakeri* Ewing in California. The mite referred to in an article by Boyce and Korsmeier (Journ. Econ. Ent., vol. 34, No. 6, p. 754, 1942) as *Cheletomimus ornatus* Berlese is actually *Cheletogenes ornatus* (Canestrini and Fanzago).

CHELETOGENES OAKLANDIA, new species

PLATE 15, FIGURES 120-122

Female.—Small mite, more elongated than *Cheletogenes ornatus*, with narrow rostrum. Femur of palpus short, broad, swollen on outer margin, with broadly squamiform dorsal seta and two simple ventral setae, the lateral seta missing; genu with broadly squamiform serrate seta on posterior margin; other palpal setae simple: palpal claw toothed for about two-thirds of its length, with 11 teeth; outer palpal comb large, with about 20 teeth; inner comb small, about one-half as long as outer, with about same number of teeth. Rostrum long, narrow, covered with a very characteristic shield, which is

tuberculate in front of the peritreme and behind the peritreme has longitudinally directed areoli as figured. Propodosomatic shield with longitudinal pattern similar to that of the posterior portion of rostral shield. Single pair of eyes. Laterad to shield are coarse striations with large tubercles; shield with four pairs of squamiform serrate marginal setae and two pairs of similar dorsal submedian setae. A shoulder seta, longer and narrower than the dorsal setae, is present. Hysterosomal shield of same pattern as anterior shield but much narrower; five pairs of marginal setae and three pairs of dorsal submedian setae which are squamiform, serrate. One pair of anal setae are squamiform and the other anal and genital setae are simple. Legs short, leg I about 166μ long; tarsus I, 48μ long; tibia I, 34μ long; tarsus I with two long and two short terminal setae and two very minute distal setae, a long rodlike sensory organ and a simple ventral seta of medium length; tibia I with a short, slightly clavate sensory seta, three squamiform serrate setae, and one simple and one serrate ventral seta. Length of body 300μ , including rostrum 393μ ; width 200μ .

Type habitat.—In fig buds.

Type locality.—Oakland, Calif.

Type.—U.S.N.M. No. 1773.

The type and two paratype females (on the same slide) were collected January 12, 1938, by E. W. Baker.

This species differs from *Cheletogenes quadrisetosus* Berlese in having squamiform setae on tibia I and in having teeth on the palpal claws. The rostral shield pattern is also distinctive.

CHELETOGENES TRAUBI, new species

PLATE 17, FIGURES 145–148

Female.—Medium-sized mite, somewhat elongated, with narrow rostrum. Femur of palpus $1\frac{1}{2}$ times as long as wide, with a dorsal squamiform seta and 2 simple ventral setae, the lateral seta missing; genu with a squamiform seta on posterior margin; palpal claw with 8 basal teeth; outer comb with about 20 teeth; inner comb about two-thirds as long and with about 17 teeth. Rostrum long, narrow, widening toward rear; rostral shield tuberculate on anterior portion and with a few longitudinal areoli on posterior portion. Peritreme simple, composed of four pairs of long segments. Propodosomatic shield large, widening to rear with a single pair of eyes and four pairs of squamiform marginal setae. Hysterosomal shield large, touching propodosomal shield, with five pairs of squamiform marginal setae. Both shields covered with a pattern composed of minute and large tubercles as figured. Genital and anal setae simple except for a single

posterior pair of squamiform setae. Legs relatively long, about 260μ in length. Tarsus I, 47μ long; tibia I, 60μ long; tarsus similar to that of *Cheletogenes oaklandia*; tibia, however, with only a single squamiform seta. Length of body 366μ , including rostrum 533μ ; width about 260μ .

Type habitat.—Crawling in tent.

Type locality.—Assam, Stillwell Road, near Ledo at 12.4-mile mark.

Type.—U.S.N.M. No. 1778.

The single female was collected by members of the United States of America Typhus Commission in 1945.

The dorsal shields and palpi distinguish this species from others in the genus.

CHELETOGENES BUCKNERI, new species

PLATE 15, FIGURES 123–125

Female.—Medium-sized mite, somewhat elongated, with narrow rostrum. Femur of palpus $1\frac{1}{2}$ times as long as wide, with a dorsal, slightly broadened serrate seta and 2 simple ventral setae, the lateral seta missing; genu with a simple dorsal seta on posterior margin; palpal claw with 6 basal teeth; outer comb broad, with 12 teeth; inner comb about one-half as long as outer comb, with about 9 small teeth. Rostrum widening toward rear; rostral shield outline indistinct, with a pattern of longitudinally lined areoli; peritreme simple, composed of long slender segments. Propodosomatic shield rounded, narrowing toward rear, with a single pair of eyes, and five pairs of squamiform serrate marginal setae; inside shoulder setae is another pair of setae. Hysterosomal shield in center of hysterosoma, rounded anteriorly, and slightly pointed toward rear, with two pairs of marginal setae; six other pairs of dorsal setae on body off shield as figured. Both shields with areoli. Anal and genital setae simple. Legs short, I and IV 166μ long. Tarsus I, 45μ long; tibia I, 37μ long; tarsus similar to that of *Cheletogenes oaklandia*, but sensory seta shorter, guard seta simple, short; tibia with rodlike sensory seta and four simple setae of medium length. Length of body 320μ , including rostrum 413μ ; width 200μ .

Type habitat.—On lemon fruits.

Type locality.—Santa Paula, Calif.

Type.—U.S.N.M. No. 1774.

The type was collected under the button of a lemon fruit, February 23, 1939, by E. W. Baker; paratype with same data but collected March 25, 1939. Another paratype collected on same host and locality October 29, 1938, by W. E. Buckner.

The shields, mouth parts, and tarsal-tibial setal arrangements are distinctive. The tibia I setae are simple, rather than narrowly clavate as in *Cheletogenes quadrisetosus* Berlese.

The mite was found associated with the citrus bud mite, *Aceria sheldoni* (Ewing), and is probably predaceous on that species.

Genus CHELETOPSIS Oudemans

Chelctopsis OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 163, 1904.

Type, *Cheyletus norneri* Poppe (original designation).

KEY TO THE SPECIES OF CHELETOPSIS 2

- | | |
|---|--------------------|
| 1. Propodosomatic shield trapezoidal with straight rear edge; the 3 pairs of setae are outside the shield----- | 2 |
| Propodosomatic shield usually oval, with strongly rounded posterior margin; the 3 pairs of setae on the shield----- | major Oudemans |
| 2. Body very long, narrow; legs longer than body is broad----- | 3 |
| Body at most twice as long as broad; legs shorter than width of body. | anax Oudemans |
| 3. The 2 pairs of anterior marginal shield setae of equal length----- | 4 |
| The inner anterior and posterior pairs of marginal setae of shields short, of equal length; the outer anterior pair about 3 times as long as inner and posterior pairs----- | impavida Oudemans |
| 4. Propodosomatic shield at most 1½ times as long as wide; the lateral dorsal setae over trochanter III long----- | 5 |
| Propodosomatic shield at least twice as long as wide; the lateral dorsal setae over trochanter III short----- | 6 |
| 5. The lateral dorsal setae over trochanter IV short, about as long as trochanter. | norneri (Poppe) |
| The lateral dorsal setae over trochanter IV long, twice as long as trochanter. | basilica Oudemans |
| 6. Claw of palpus with 2 basal teeth----- | animosa Oudemans |
| Claw of palpus with 1 basal tooth----- | magnanima Oudemans |

CHELETOPSIS MAJOR Oudemans

Cheyletus major TROUESSART, in Berlese, Acari, Myriapoda et Scorpiones hucusque in Italia, Prostigmata, pp. 74-75, 1893 (*nomen nudum*).

Cheletopsis major OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 163, 1904;
Mém. Soc. Zool. France, vol. 19, pp. 200-204, fig. 62, 1906.

Type habitat.—On *Hemiprocne mystacea* (= *Dendrochelidon mystacea*).

Type locality.—New Guinea.

CHELETOPSIS ANAX Oudemans

Cheletopsis anax OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 19, p. 170, 1904;
Mém. Soc. Zool. France, vol. 19, pp. 195-200, figs. 59-61, 1906.

Type habitat.—In shafts of wing feathers of *Crocethia alba* (= *Totanus calidris*).

Type locality.—France.

² None of these species is represented in the National Museum.

CHELETOPSIS IMPAVIDA Oudemans

Cheletopsis imparida OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 19, p. 170, 1904; Mém. Soc. Zool. France, vol. 19, pp. 175-180, fig. 48, 1906.

Type habitat.—In shafts of wing feathers of *Crocethia alba* (= *Totanus calidris*), and also free living.

Type locality.—France.

CHELETOPSIS NORNERI (Poppe)

Cheyletus norneri POPPE, Abh. Naturw. Ver. Bremen, vol. 10, p. 239, pl. 2, figs. 4, 5, 1888.

Cheletopsis norneri (Poppe) OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 19, p. 170, 1904; Mém. Soc. Zool. France, vol. 19, pp. 180-186, figs. 52-54, 1906.

Type habitat.—In shafts of tail feathers of *Sterna hirundo*.

Type locality.—France.

CHELETOPSIS BASILICA Oudemans

Cheletopsis basilica OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 19, p. 170, 1904; Mém. Soc. Zool. France, vol. 19, pp. 186-189, fig. 55, 1906.

Type habitat.—In shafts of feathers of *Crocethia alba* (= *Totanus calidris*).

Type locality.—France.

CHELETOPSIS ANIMOSA Oudemans

Cheletopsis animosa OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 19, p. 170, 1904; Mém. Soc. Zool. France, vol. 19, pp. 189-193, figs. 56, 57, 1906.

Type habitat.—In wing-feather shafts of *Tringa totanus* (= *Totanus totanus*).

Type locality.—France.

CHELETOPSIS MAGNANIMA Oudemans

Cheletopsis magnanima OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 19, p. 170, 1904; Mém. Soc. Zool. France, vol. 19, pp. 193-195, fig. 58, 1906.

Type habitat.—On *Tringa flavipes* (= *Gambetta flavipes*), probably in shafts of the large feathers.

Type locality.—Angers, France. Material collected on bird skin in museum.

Genus CHELONOTUS Berlese

Chelonotus BERLESE, Acari, Myriapoda et Scorpiones hucusque in Italia reperta, Prostigmata, p. 73, 1893.

Chelonotus TROUSSART, Oudemans, Mém. Soc. Zool. France, vol. 19, pp. 158, 159, 1906.

Type, *Chelonotus sclenirhynchus* Berlese (monotypic).

KEY TO THE SPECIES OF CHELONOTUS

- CHELONOTUS OUDEMANSI**, new species

Female.—Elongated mite; body narrowing rapidly anteriorly and posteriorly; rostrum almost triangular; palpi short and swollen. Femur of palpus large, swollen, about as long as wide, dorsal and ventral setae simple; other palpal setae simple; palpal claw large with a single large basal tooth; a single coarse palpal comb with 10 teeth and a short, broad, lanceolate sensory organ on palpal tarsus. Peritreme distinctive, as figured. Dorsal body setae long, simple, discernible only on lateral margins of body; three pairs of setae on propodoso-

matic shield and four pairs on hysterosomal shield; shields contiguous on dorsum and covering part of venter. Ventral setae long, simple. Legs not long in proportion to body; leg setae simple; tarsus I with sensory seta missing (broken), but otherwise as figured for *C. oudemansi*, new species; tibia I with a very short rodlike sensory seta. Coxae I-II and III-IV separated into two groups. Length of body 628μ , including rostrum 743μ ; width 328μ .

Type host.—*Callosciurus prevostii rubiventer* Müller and Schlegel.

Type locality.—Temboan, Celebes.

The type, U.S.N.M. No. 1776, was collected on a squirrel from the Celebes in the collection of the United States National Museum. No other data given.

The gnathosomal characters distinguish this species from *Chelonotus selenirhynchus*.

CHELONOTUS SELENIRHYNCHUS Berlese, new author combination

Chelonotus selenirhynchus BERLESE, Acari, Myriapoda et Scorpiones hucusque in Italia, Prostigmata, p. 77, pl. 1, fig. 6, 1893.

Chelonotus selenirhynchus Trouessart, OUDEMANS, Mém. Soc. Zool. France, vol. 19, pp. 159-162, fig. 42, 1906.

Type host.—*Baginia tenuis lowii* Thomas (= *Sciurus lowii*).

Type locality.—Borneo.

Since the original description is by Berlese and not by Trouessart, Berlese is here established as the author.

Genus ACAROPSIS Moquin-Tandon

Acaropsis MOQUIN-TANDON, Éléments de zoologie médicale . . . , p. 314, 1863.

Type, *Tyroglyphus mericourti* Laboulbene, 1851 (monotypic).

KEY TO THE SPECIES OF ACAROPSIS

1. Dorsal setae pilose..... 2
Dorsal setae smooth..... *mericourti* (Laboulbene)
2. Palpal claw with a single tooth..... 3
Palpal claw with more than 1 tooth..... 4
3. Male: Palpi very long, palpal femur 4 times as long as wide; anterior shield very broad, even with width of body; posterior shield shorter and narrower than anterior and with 2 pairs of marginal setae..... *sollers* Kuzin
Male: Palpi and palpal claw long, with a single tarsal tooth; 9 pairs of dorsal setae..... *rufus* (Karpelles)
4. With not more than 4 teeth on palpal claw..... 6
With more than 6 teeth on palpal claw..... 5
5. Palpal claw with 6 teeth; anterior shield widening toward rear; posterior shield covering most of abdomen; dorsal setae clavate, serrate.
kulagini Rodendorf
Palpal claw with 8 teeth; anterior shield wider anteriorly than posteriorly; posterior shield minute; dorsal setae lanceolate, serrate.
travisi, new species

6. Palpal femur $1\frac{1}{2}$ to $1\frac{2}{3}$ as long as wide; palpal claws with 2 or 3 teeth.

docta Berlese

Palpal femur more than twice as long as wide; palpal claw with 3 or 4 teeth.

callida Kuzin

ACAROPSIS MERICOURTI (Laboulbene)

Tyroglyphus mericourti LABOULBENE, Ann. Soc. Ent. France, ser. 2, vol. 9, p. 302, pl. 9, fig. 4, 1851.

Acaropsis pectinata (Laboulbene) MOQUIN-TANDON, Éléments de zoologie médicale . . . , p. 314, 1863.

Acaropsis mericourti (Laboulbene) OUDEMANS, Mém. Soc. Zool. France, vol. 19, p. 163, 1906.

Type habitat.—Unknown.

Type locality.—Newfoundland, Canada.

ACAROPSIS KULAGINI Rodendorf

Acaropsis kulagini RODENDORF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, p. 78, 1940.

Type habitat.—In Indian-corn grain.

Type locality.—Stavropolsk and Blagodarnoe, Union of Soviet Socialist Republics.

ACAROPSIS TRAVISI, new species

PLATE 16, FIGURES 131–135

Female.—Palpi and rostrum long; palpal femur about $1\frac{1}{2}$ times as long as broad, outer margin swollen and inner margin more or less straight; palpal setae simple; genual seta on posterior margin of segment; apparently 8 basal teeth on palpal claw; palpal comb about two-thirds as long as claw, with about 14 long teeth. Peritreme of strong segments as figured. Single pair of eyes; dorsal setae short, lanceolate, serrate. Propodosomal shield hard to distinguish, wider anteriorly than posteriorly, longer than wide, with five pairs of marginal setae, three pairs in the anterior corners and two pairs in the posterior corners. A pair of very long shoulder setae about 100μ long, and anterior to these a pair of short setae. Hysterosomal shield very small, hard to distinguish, without setae but with setae near the anterior and posterior margins as figured; other dorsal hysterosomal setae arranged as figured. Genital area with two pairs of simple setae; three pairs of anal setae. Legs normal, leg I about 200μ long; leg IV about 166μ long; leg setae similar to body setae; tarsus I, 73μ long, tibia I, 33μ long; tarsus sensory seta long, rodlike, guard seta minute; tibia with short, slightly clavate sensory seta, other setae simple. Length of body 253μ , including rostrum 386μ ; width 153μ .

Type host.—*Sceloporus woodi*.

Type locality.—Newton, Ga.

Type.—U.S.N.M. No. 1776.

Described from the type collected September 1, 1937, by B. V. Travis. A paratype mite is on the same slide.

ACAROOPSIS SOLLERS Kuzin

Acaropsis sollers KUZIN, in Rodendorf, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, pp. 78, 79, 1940.

Type habitat.—Unknown.

Type locality.—Leningrad, Union of Soviet Socialist Republics.

ACAROOPSIS RUFUS (Karpelles)

Cheyletus rufus KARPELLES, Berlin. Ent. Zeitschr., vol. 28, p. 231, figs. 104, 1884.
Acaropsis rufa (Karpelles) OUDEMANS, Mém. Soc. Zool. France, vol. 19, p. 163, 1906.

Type habitat.—Associated with Coleoptera.

Type locality.—Congo region of central Africa.

ACAROOPSIS DOCTA (Berlese)

PLATE 16, FIGURES 136-139

Cheyletus docta BERLESE, Acari, Myriapoda et Scorpiones hucusque in Italia reperta, Prostigmata, fasc. 33, No. 1, 1886.

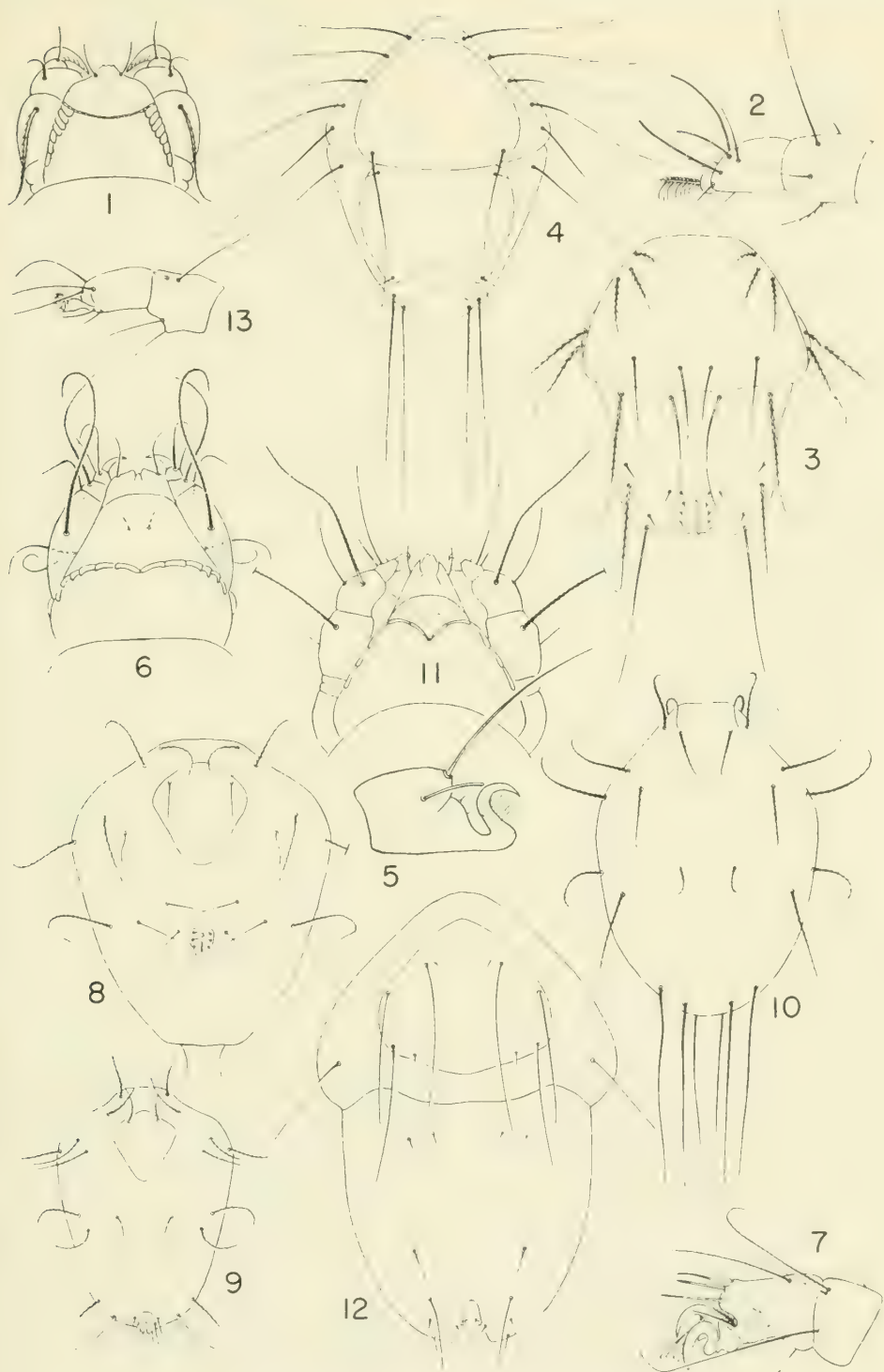
Acaropsis docta (Berlese) OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 21, p. 209, 1905 (1904); Mém. Soc. Zool. France, vol. 19, pp. 163-168, figs. 43, 44, 1906.—VITZTHUM, Die Tierwelt Mitteleuropas, vol. 3, No. 3, p. 55, 1929.—RODENDORF, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, pp. 80, 81, 1940.

Female.—Palpal femur about $1\frac{1}{2}$ to $1\frac{2}{3}$ as long as wide; palpal femur seta long, finely pilose; other setae simple; genual seta on posterior margin of segment; palpal claw thin, with 3 basal teeth; comb about two-thirds as long as claw, with about 15 heavy teeth. Peritreme simple, rounded. Propodosomatic shield with single pair of eyes; setae broadening distally, elongate, pilose, three pairs on anterolateral margin of shield, four pairs of dorsal submedian setae; a pair of long simple shoulder seta not on shield. Hysterosomal shield widely separated from anterior shield, longer than wide and broadly rounded posteriorly, tending to narrow somewhat toward rear; two pairs of lateral lanceolate setae and four pairs of similar dorsal submedian setae; a single pair of setae posterior to the shield; a single pair of setae on body near anterior angles of shield. Genital opening with three pairs of simple setae, one median and two posterior; three pairs of simple anal setae. Legs normal; leg I, 333μ long; tarsus I, 90μ long; tibia I, 73μ long; tarsus I with a simple, long, straight, rodlike sensory seta; sensory seta on tibia I short, rodlike. Length of body 571μ , including rostrum 714μ ; width about 385μ .

Male.—Not seen, but as figured by Rodendorf very similar to female but with long anterior pair of legs and larger anterior shield.

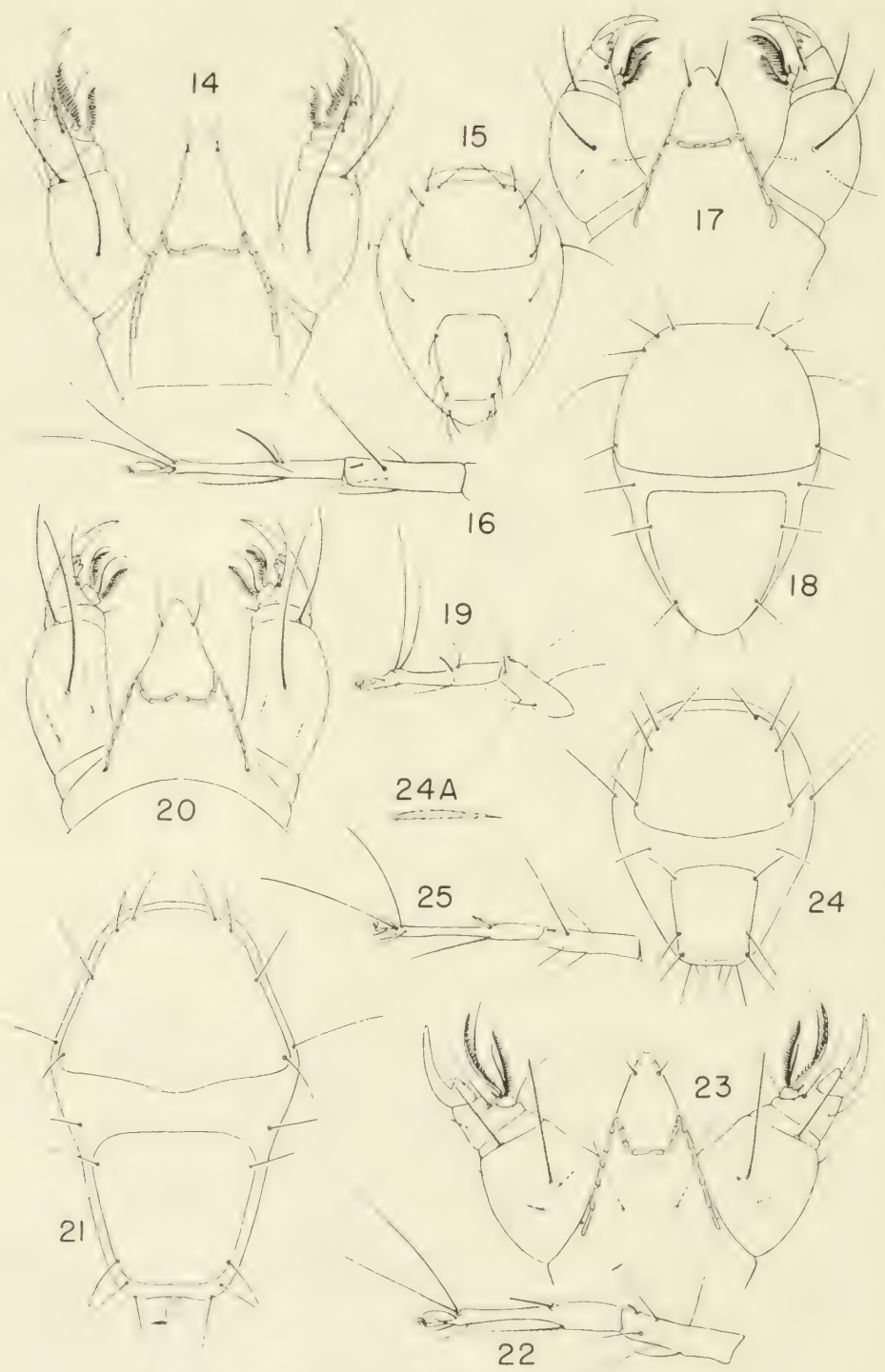
Type habitat.—In building.

Type locality.—Florence, Italy.



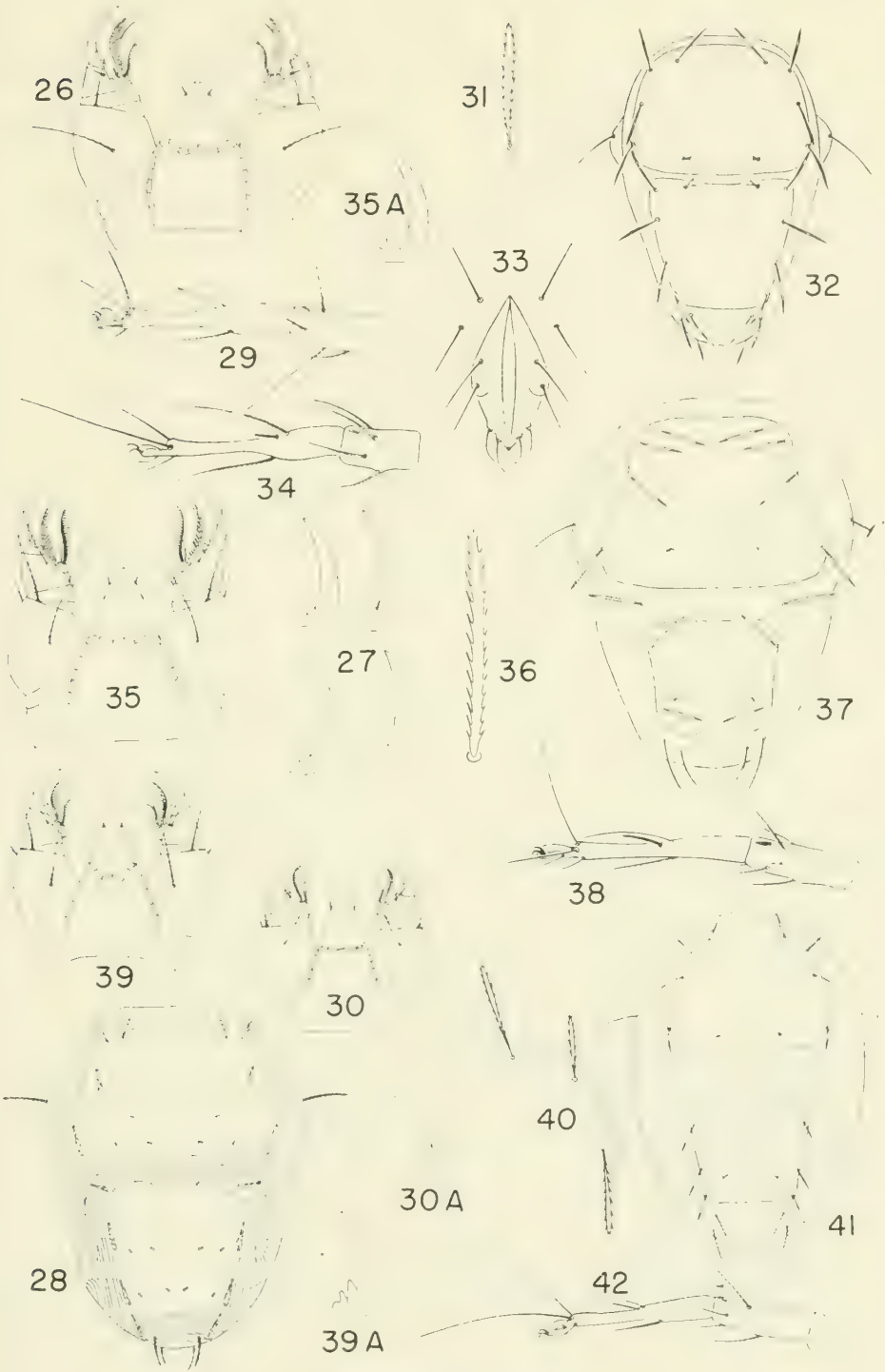
SPECIES OF CHEYLETIELLA AND NEOCHEYLETIELLA.

FOR EXPLANATION SEE PAGE 317.



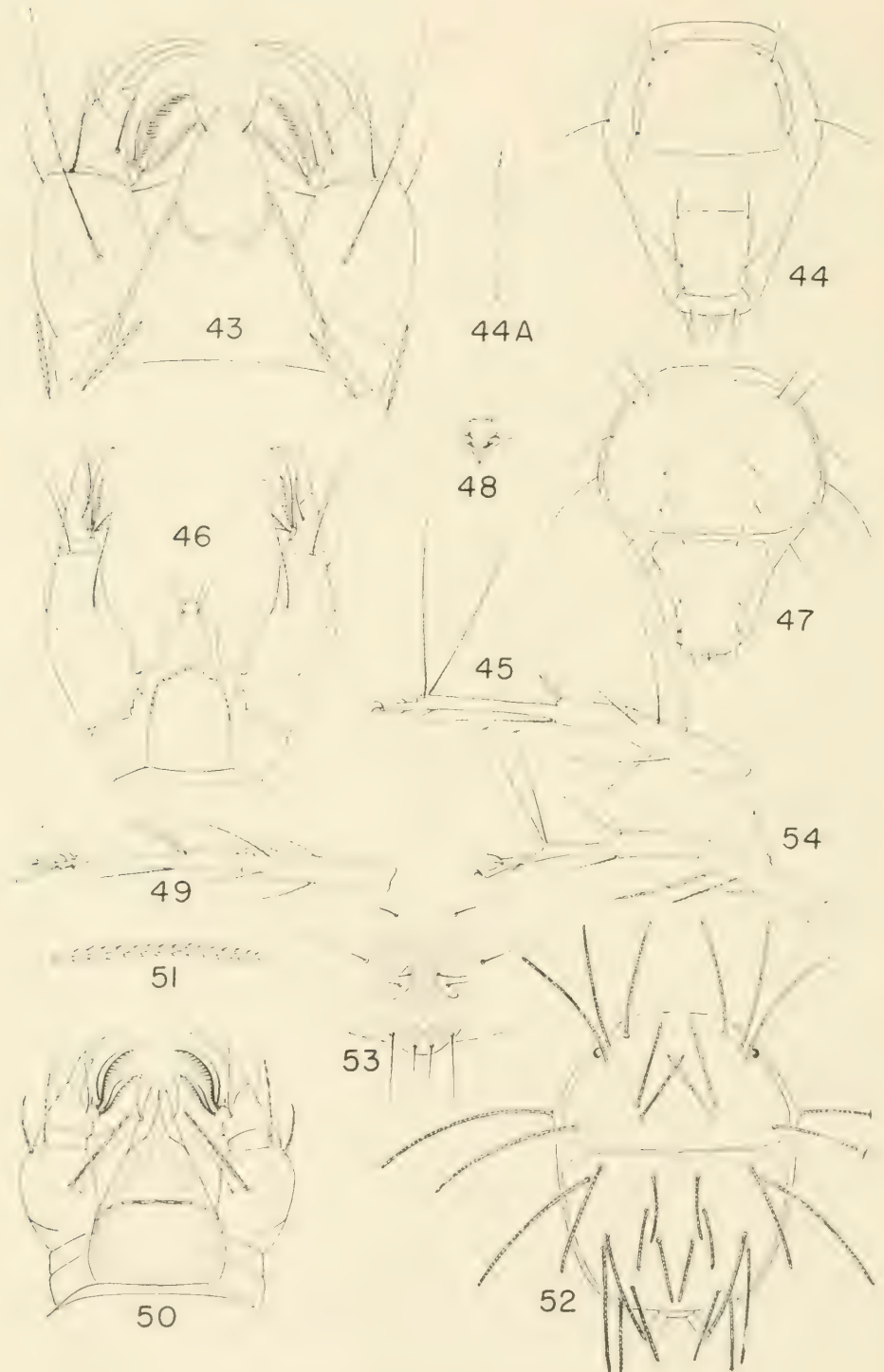
SPECIES OF CHEYLETUS.

FOR EXPLANATION SEE PAGE 316



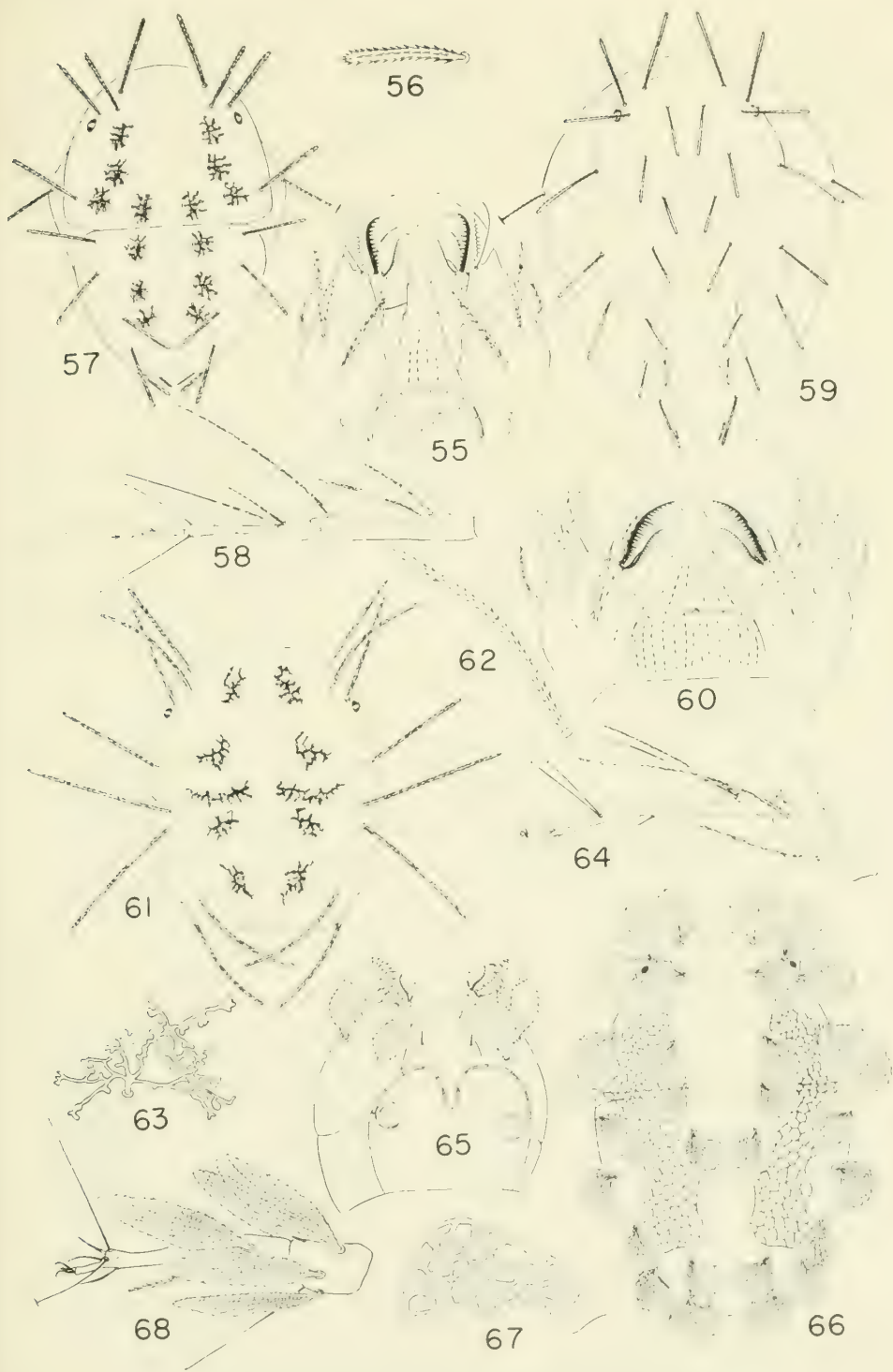
SPECIES OF CHEYLETUS.

FOR EXPLANATION SEE PAGE 317.



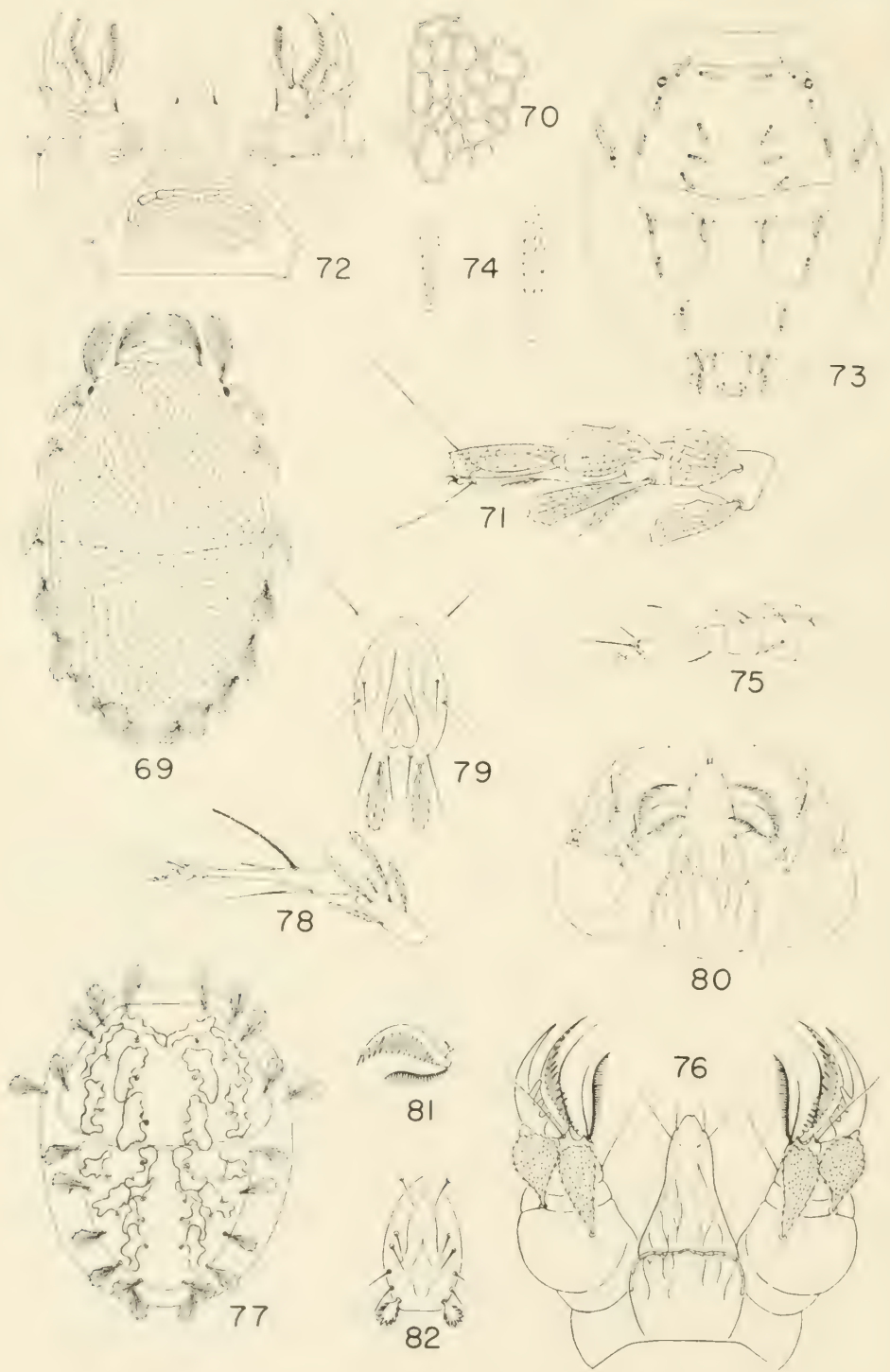
SPECIES OF CHEYLETUS AND CHELETOPHYES.

FOR EXPLANATION SEE PAGE 107.



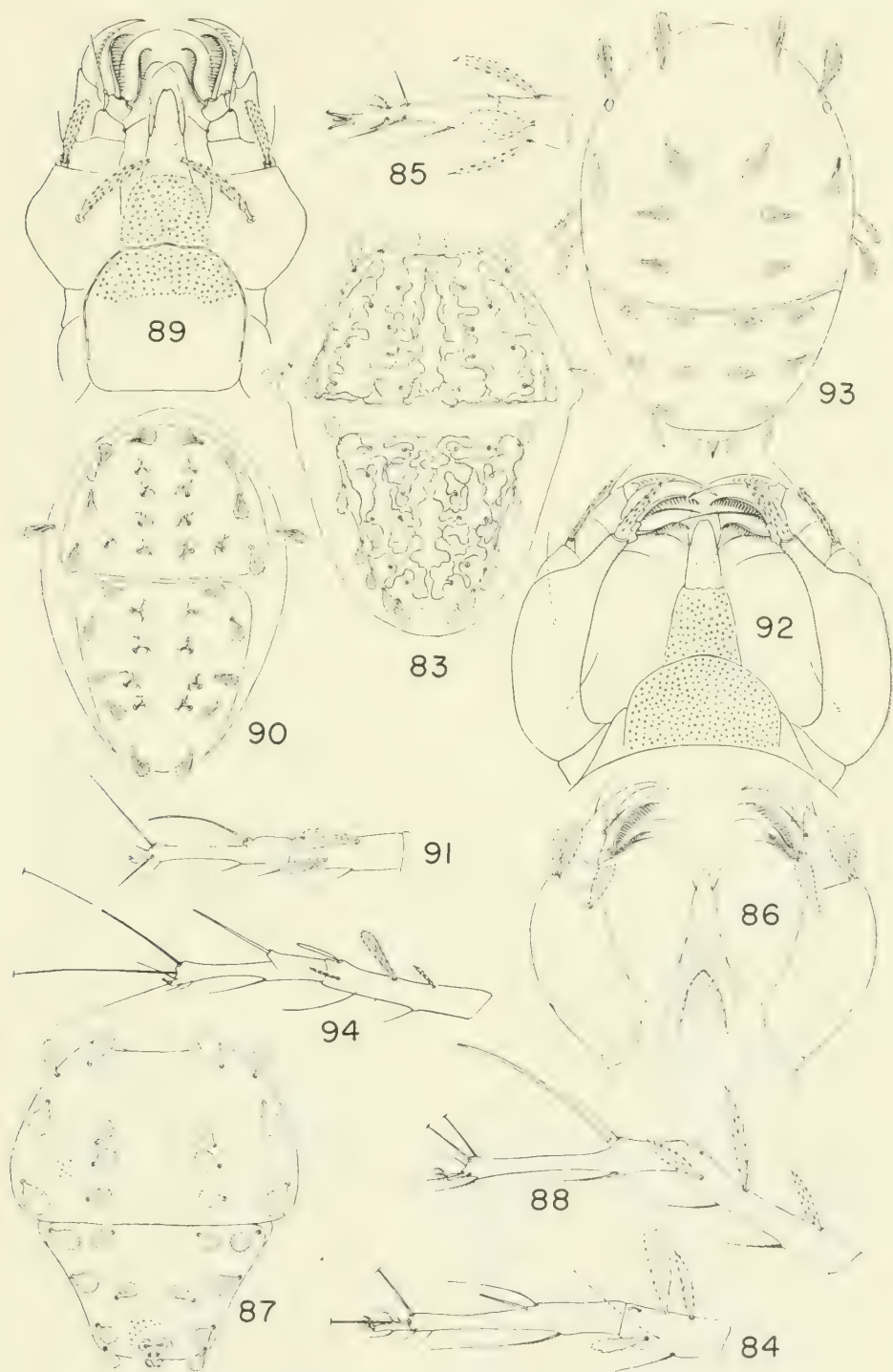
SPECIES OF CHELETOPHYES AND EUCHEYLA.

FOR EXPLANATION SEE PAGE 317.



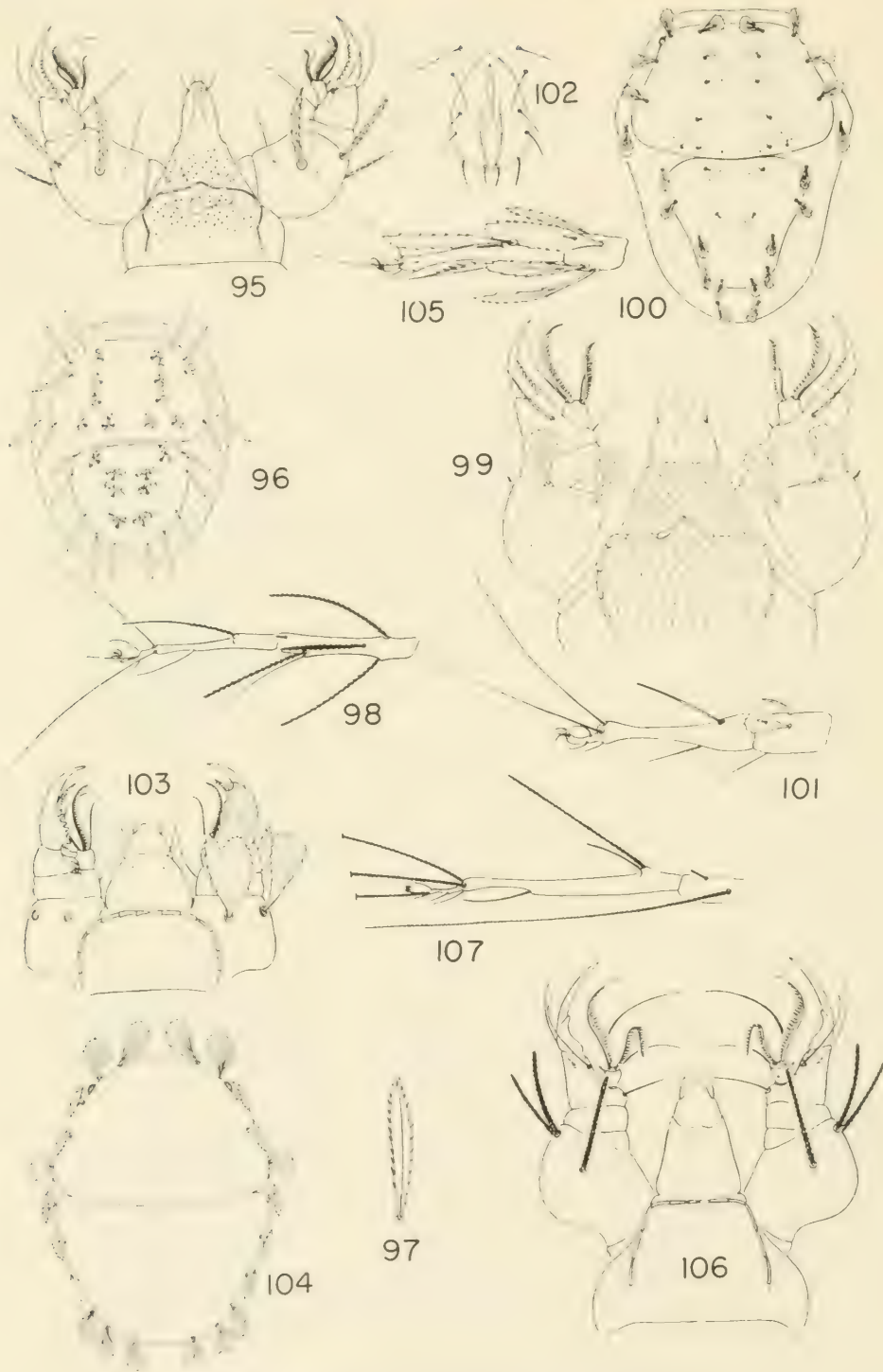
SPECIES OF EUCHEYLA, CHELETOMIMUS, AND EUCHEYLETIA.

FOR EXPLANATION SEE PAGE 317.



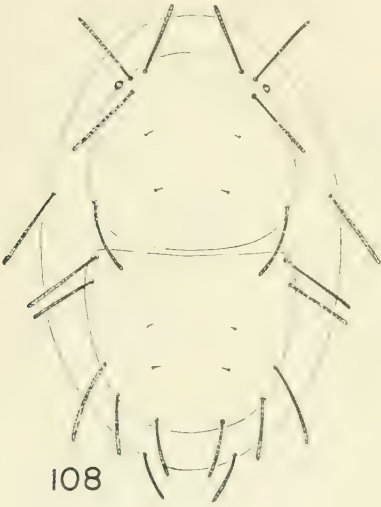
SPECIES OF EUCHEYLETIA AND CHEYLETIA.

FOR EXPLANATION SEE PAGE 318.

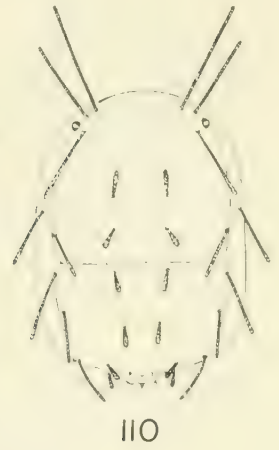


SPECIES OF CHEYLETIA AND CHELETOMORPHA.

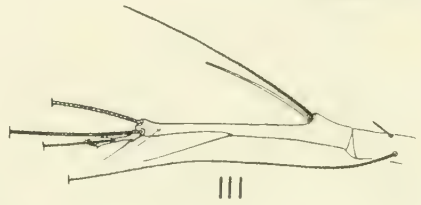
FOR EXPLANATION SEE PAGE 318.



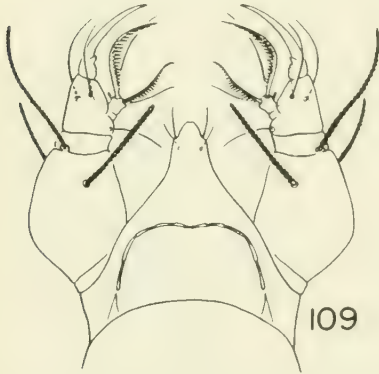
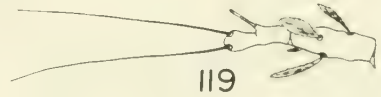
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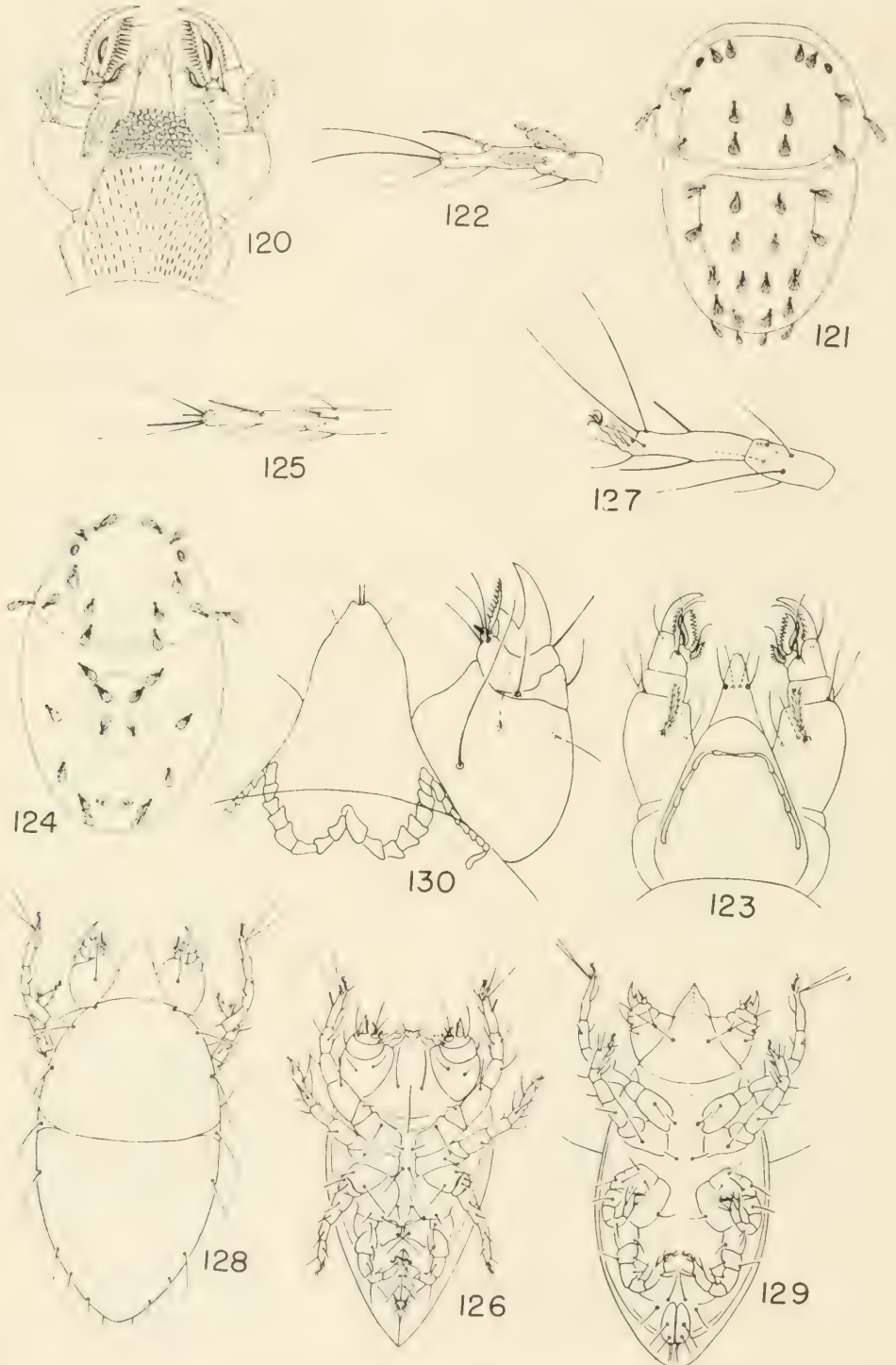
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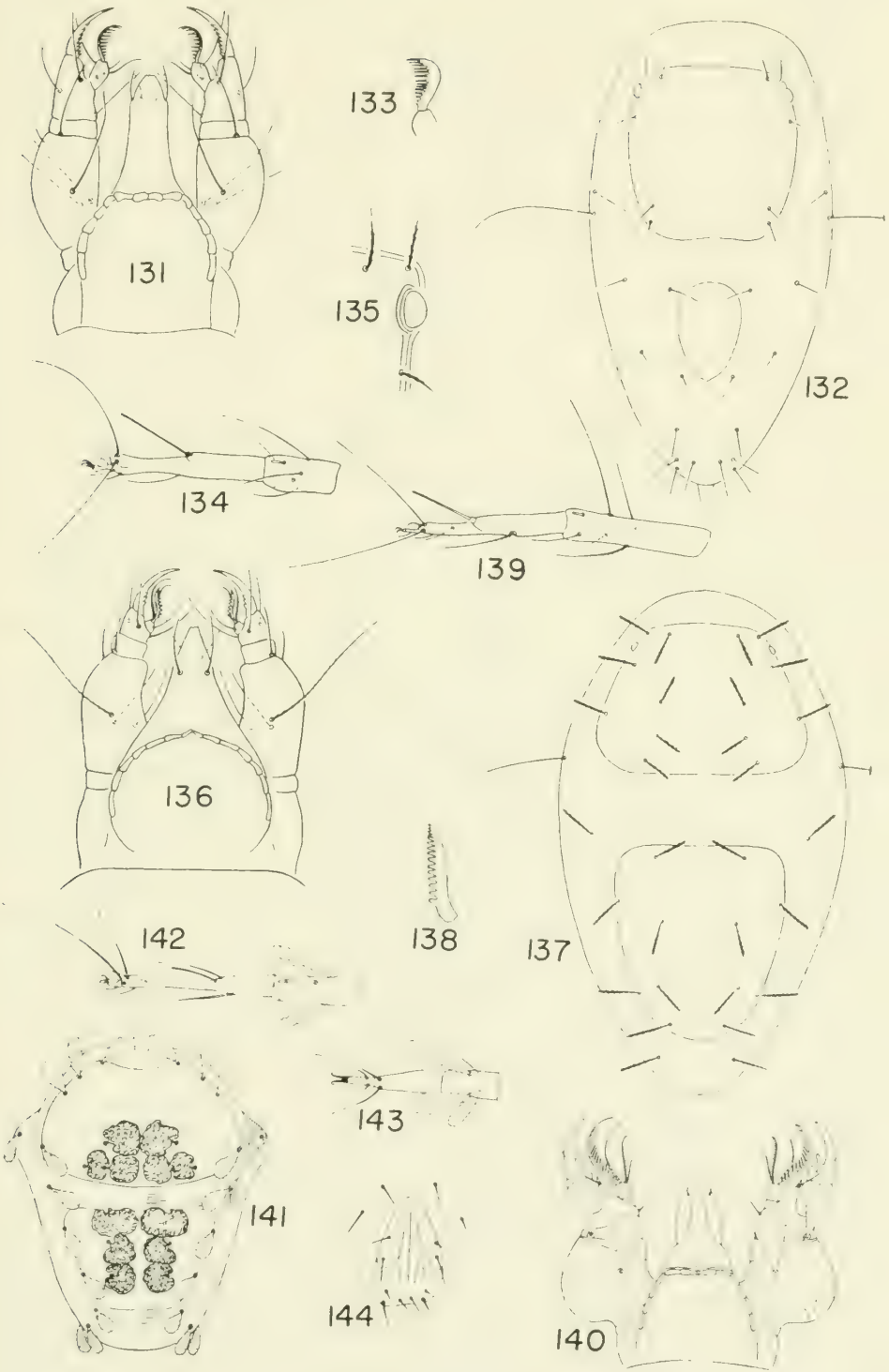
SPECIES OF CHELETOMORPHA, EUTOGENES, AND CHELETOGENES.

FOR EXPLANATION SEE PAGE 318.



SPECIES OF CHELETOGENES AND CHELONOTUS.

FOR EXPLANATION SEE PAGE 318.



SPECIES OF ACAROPSIS AND EUCHEYLETIA.

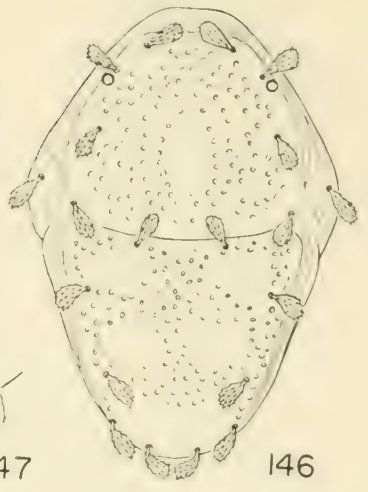
FOR EXPLANATION SEE PAGES 31-314.



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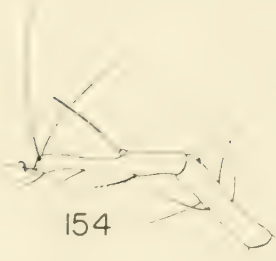
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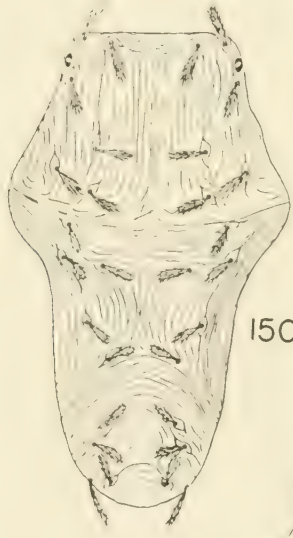
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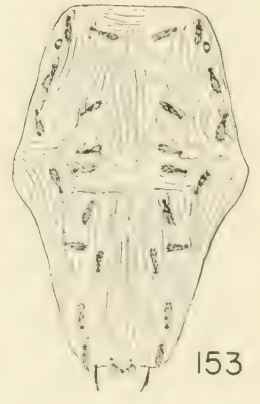
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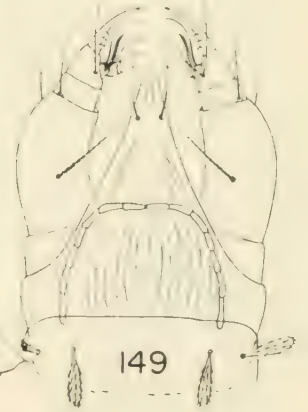
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SPECIES OF CHELETOGENES AND CHELACAROPSIS.

FOR EXPLANATION SEE PAGE 319.

This appears to be a cosmopolitan species. The specimens in the United States National Museum collection were taken on wheat at Chambersburg, Pa., November 14, 1930, by J. O. Chambers.

ACAROOPSIS CALLIDA Kuzin

Acaropsis callida KUZIN, in Rodendorf, Wiss. Ber. Moskauer Staats Univ. Zool., vol. 42, pp. 79, 80, 1940.

Type habitat.—In grain infested with mites.

Type locality.—Rostov on Don, Union of Soviet Socialist Republics.

Genus CHELETOSOMA Oudemans

Cheletosoma OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 21, p. 207, 1905 (1904).

Type, *Cheletosoma tyrannus* Oudemans (monotypic).

CHELETOSOMA TYRANNUS Oudemans

Cheletosoma tyrannus OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 21, p. 207, 1905 (1904); Mém. Soc. Zool. France, vol. 19, pp. 168-174, 1906.

Type habitat.—In shafts of wing feathers of *Aramus guarana* (= *A. scolopaceus*).

Type locality.—"Tropical America."

CHELACAROOPSIS, new genus

Palpal tarsus possessing only one comblike seta and two sicklelike setae; a pair of eyes present on propodosoma; dorsal body setae broadly clavate-serrate; no dorsal shields.

Type, *Chelacaropsis moorei*, new species.

This genus, erected to include a male and female cheyletid, is related to the genus *Acaropsis*, but differs in having no indication of dorsal shields and in having broadly clavate-serrate dorsal body setae.

CHELACAROOPSIS MOOREI, new species

PLATE 17, FIGURES 149-154

Female.—Small mite with narrow body and rostrum. Palpi elongate, femur almost twice as long as wide, the dorsal seta simple, serrate; other palpal setae simple; palpal claw long, narrow, with 3 basal teeth; palpal tarsus with 2 sicklelike setae and only 1 comblike seta which possesses 13 short teeth. Pattern on dorsum of rostrum composed of longitudinal striations; peritreme simple, possessing seven pairs of segments. No dorsal shields or indications of shields; striations on anterior portion of propodosoma and hysterosoma longitudinal striations on posterior portions transverse. A pair of lateral

eyes. Dorsal setae broadly squamiform, serrate, six pairs on propodosoma and eight pairs on hysterosoma. Leg I about 230μ long; femur of all legs with a dorsal squamiform serrate seta similar to those on dorsum of mite. Tarsus I, 24μ long; tibia I, 52μ long; sensory seta of tarsus I almost half as long as tarsus; guard seta, if present, not seen. Length of body 300μ , including rostrum 407μ ; approximate width 186μ .

Male.—Similar to female. Palpi elongate; femur about twice as long as wide, dorsal seta simple, serrate; ventral seta appears to be on large tubercle; other palpi setae simple; palpal claw with 4 basal teeth; venter of rostrum with a series of about 11 teeth jutting out beneath base of palpus. Peritreme with seven pairs of segments; dorsal pattern between peritreme composed of longitudinal striations. Body setae and striations more or less as in female; seven pairs of setae on propodosoma and six pairs on hysterosoma. Leg I about 213μ long; femur of all legs with squamiform-serrate seta. Tarsus I, 67μ long; tibia I, 47μ long; sensory seta on tarsus I slightly more than half as long as tarsus; guard seta, if present, not seen. Length of body 233μ , including rostrum 400μ ; width 140μ .

Type habitat.—Found on *Glaucomys volans querceti* (Bangs).

Type locality.—Welaka, Fla.

Type.—U.S.N.M. No. 1777.

The single type female and allotype male were collected by S. C. Moore, August 16, 1946.

EXPLANATION OF PLATES

PLATE 6

- 1-3. *Cheyletiella parasitivorax* (Megnin): 1, Gnathosoma, female; 2, tarsus and tibia I, female; 3, dorsal view of body, female.
- 4, 5. *Neochyletiella canadensis* (Banks): 4, Dorsal view of body, female; 5, tarsus I, female.
- 6-9. *Neochyletiella smallwoodae*, new species: 6, Gnathosoma, female; 7, tarsus and tibia I, female; 8, dorsal view of body, male; 9, dorsal view of body, female.
10. *Neochyletiella rohweri*, new species: 10, Dorsal view of body, female.
- 11-13. *Neochyletiella chanayi* (Berlese and Trouessart): 11, Gnathosoma, female; 12, dorsal view of body, female; 13, tarsus and tibia I, female.

PLATE 7

- 14-16. *Cheyletus eruditus* (Schränk): 14, Gnathosoma, female; 15, dorsal view of body, female; 16, tarsus and tibia I, female.
- 17-19. *Cheyletus hendersoni*, new species: 17, Gnathosoma, female; 18, dorsal view of body, female; 19, tarsus and tibia I, female.
- 20-22. *Cheyletus doddi*, new species: 20, Gnathosoma, female; 21, dorsal view of body, female; 22, tarsus and tibia I, female.
- 23-25. *Cheyletus fortis* Oudemans: 23, Gnathosoma, female; 24, dorsal view of body, female; 24A, dorsal body seta; 25, tarsus and tibia I, female.

PLATE 8

- 26-29. *Cheyletus linsdalei*, new species: 26, Gnathosoma, female; 27, palpal claw variations in female; 28, dorsal view of body, female; 29, tarsus and tibia I, female.
- 30-34. *Cheyletus cacahuamilpensis*, new species: 30, Gnathosoma, female; 30A, palpal claw, female; 31, dorsal body seta, female; 32, dorsal view of body, female; 33, genital-anal region, female; 34, tarsus and tibia I, female.
- 35-38. *Cheyletus beauchampi*, new species: 35, Gnathosoma, female; 35A, palpal claw, female; 36, dorsal body seta, female; 37, dorsal view of body, female; 38, tarsus and tibia I, female.
- 39-42. *Cheyletus davisi*, new species: 39, Gnathosoma, female; 39A, palpal claw of female; 40, anterior corner of propodosomatic shield, female; 41, dorsal view of body, female; 42, tarsus and tibia I, female.

PLATE 9

- 43-49. *Cheyletus malaccensis* Oudemans: 43, Gnathosoma, female; 44, dorsal view of body, female; 44A, dorsal body seta, female; 45, tarsus and tibia I, female; 46, gnathosoma, male; 47, dorsal view of body, male; 48, detail of genital region, male; 49, tarsus and tibia I, male.
- 50-54. *Cheletophyes philippinensis*, new species: 50, Gnathosoma, female; 51, dorsal palpal seta, female; 52, dorsal view of body, female; 53, genital-anal region, female; 54, tarsus and tibia I, female.

PLATE 10

- 55-59. *Cheletophyes hawaiiensis*, new species: 55, Gnathosoma, female; 56, dorsal seta of palpus, female; 57, dorsal view of body, female; 58, tarsus and tibia I, female; 59, nymph.
- 60-64. *Cheletophyes marshalli*, new species: 60, Gnathosoma, female; 61, dorsal view of body, female; 62, dorsal marginal body seta, female; 63, dorsal submedian seta, female; 64, tarsus and tibia I, female.
- 65-68. *Eucheyla panamensis*, new species: 65, Gnathosoma, female; 66, dorsal view of body, female; 67, detail of reticulation, female; 68, tarsus and tibia I, female.

PLATE 11

- 69-71. *Eucheyla whartoni*, new species: 69, Dorsal view of body, female; 70, detail of dorsal reticulation, female; 71, tarsus, tibia and genu of leg I, female.
- 72-75. *Cheletomimus berlesci* (Oudemans): 72, Gnathosoma, female; 73, dorsal view of body, female; 74, dorsal body setae, female; 75, tarsus and tibia I, female.
- 76-79. *Eucheyletia harpyia* (Rodendorf): 76, Gnathosoma, female; 77, dorsal view of body, female; 78, tarsus and tibia I, female; 79, genital-anal region, female.
- 80-82. *Eucheyletia bishoppi*, new species: 80, Gnathosoma, female; 81, palpal combs, female; 82, genital-anal region, female.

PLATE 12

- 83-88. *Eucheyletia bishoppi*, new species: 83, Dorsal view of body, female; 84, tarsus and tibia I, female; 85, tarsus and tibia III, female; 86, gnathosoma, male; 87, dorsal view of body, male; 88, tarsus and tibia I, male.
- 89-94. *Cheyletia pyriformis* (Banks): 89, Gnathosoma, female; 90, dorsal view of body, female; 91, tarsus and tibia I, female; 92, gnathosoma, male; 93, dorsal view of body, male; 94, tarsus and tibia I, male.

PLATE 13

- 95-98. *Cheyletia virginicensis*, new species: 95 Gnathosoma, female; 96, dorsal view of body, female; 97, dorsal body seta, female; 98, tarsus and tibia I, female.
- 99-102. *Cheyletia wellsi*, new species: 99, Gnathosoma, female; 100, dorsal view of body, female; 101, tarsus and tibia I, female; 102, genital-anal region, female.
- 103-105. *Cheyletia squamosa* (Degeer): 103, Gnathosoma, female; 104, dorsal view of body, female; 105, tarsus and tibia I, female.
- 106-107. *Cheletomorpha lepidopterorum* (Shaw): 106, Gnathosoma, female; 107, tarsus and tibia I, female.

PLATE 14

- 108-112. *Cheletomorpha lepidopterorum* (Shaw): 108, Dorsal view of body, female; 109, gnathosoma, male; 110, dorsal view of body, male; 111, tarsus and tibia I, male; 112, dorsal submedian seta, male.
- 113-116. *Eutogenes foxi*, new species: 113, Gnathosoma, female; 114, dorsal view of body, female; 115, genital-anal region, female; 116, tarsus and tibia I, female.
- 117-119. *Cheletogenes ornatus* (Canestrini and Fanzago): 117, Gnathosoma, female; 118, dorsal view of body, female; 119, tarsus and tibia I, female.

PLATE 15

- 120-122. *Cheletogenes onklandia*, new species: 120, Gnathosoma, female; 121, dorsal view of body, female; 122, tarsus and tibia I, female.
- 123-125. *Cheletogenes buckneri*, new species: 123, Gnathosoma, female; 124, dorsal view of body, female; 125, tarsus and tibia I, female.
- 126, 127. *Chelonotus oudemansi*, new species: 126, Ventral view of body, female; 127, tarsus and tibia I, female.
- 128-130. *Chelonotus ewingi*, new species: 128, Dorsal view of body, female; 129, ventral view of body, female; 130, detail of gnathosoma, female.

PLATE 16

- 131-135. *Acaropsis trarisi*, new species: 131, Gnathosoma, female; 132, dorsal view of body, female; 133, palpal comb, female; 134, tarsus and tibia I, female; 135, detail of anterolateral margin of propodosomatic shield.
- 136-139. *Acaropsis docta* (Berlese): 136, Gnathosoma, female; 137, dorsal view of body, female; 138, palpal comb, female; 139, tarsus and tibia I, female.

- 140-144. *Euchyletia hardyi*, new species: 140, Gnathosoma, female; 141, dorsal view of body, female; 142, tarsus and tibia I, female; 143, tarsus and tibia III, female; 144, genital-anal region, female.

PLATE 17

- 145-148. *Cheletogenes traubi*, new species: 145, Gnathosoma, female; 146, dorsal view of body, female; 147, genital-anal region, female; 148, tarsus and tibia I, female.
- 149-154. *Chelacaropsis moorci*, new species: 149, Gnathosoma, female; 150, dorsal view of body, female; 151, tarsus and tibia I, female; 152, ventral view of gnathosoma, male; 153, dorsal view of body, male; 154, tarsus and tibia I, male.

NOTE

The following two species were inadvertently omitted from the general text:

- Cheyletus parumsetosus* KARPELLES, Berlin. Ent. Zeitschr., vol. 28, fasc. 2, pp. 232, 238, 1884.—OUDEMANS, Mém. Soc. Zool. France, vol. 19, p. 81, 1906.
- Cheyletus promptus* OUDEMANS, Ent. Ber. Nederl. Ver., vol. 1, fasc. 18, p. 161, 1904; Mém. Soc. Zool. France, vol. 19, p. 81, 1906.

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(Synonyms are printed in *italics*)

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A NEW SPECIES OF COPEPOD OF THE GENUS CORYCAEUS FROM THE NORTH AMERICAN COAST

By MILDRED STRATTON WILSON

PLANKTON collections from two coastal areas of North America, sent to the United States National Museum for identification, have been found to contain an unknown species of the cyclopoid copepod genus *Corycaeus*. These collections were recently made at Beaufort Inlet, North Carolina, by William H. Sutcliffe, Jr., and in the Gulf of Mexico by Joel W. Hedgpeth. In addition, examination of a single female from the Chesapeake Bay area, reported by C. B. Wilson (1932) as *Corycaeus lubbockii* Giesbrecht, shows that it also is referable to this species.

Family CORYCAEIDAE

Genus CORYCAEUS Dana

CORYCAEUS (DITRICHOCORYCAEUS) AMERICANUS, new species

PLATE 18

Corycaeus lubbockii, C. B. WILSON, 1932, p. 42.

Specimens examined.—1 female, 8 males, collected in plankton tow just inside Beaufort Inlet, N. C., at high tide, June 20, 1947, by William H. Sutcliffe, Jr. Occurring with *Corycaeus (Ditrichocorycaeus) amazonicus* F. Dahl.

4 females, 4 males, collected in plankton tow, Point Aransas, Tex., April 18, 1946; 1 female, near shore, Texas coast, Gulf of Mexico, April 20, 1947, by Joel W. Hedgpeth. Also occurring with *C. amazonicus*.

1 female, U. S. N. M. No. 58530, collected at the 100-fathom line, outside Chesapeake Bay, August 21, 1920.

Types.—Holotype female, U. S. N. M. No. 85980; allotype male, No. 85979; locality, Beaufort Inlet, N. C.

Diagnosis.—Possessing these characters of the subgenus *Ditrachocorycaeus* M. Dahl: Constituent of coastal plankton; small size; rounded ventral process; leg 4 with its endopod bearing 2 setae, and its second basal segment with a small protuberance inside; spine of basal segment of second antenna of female three times longer than that of the second segment, only slightly longer in the male. Distinguished by: Well-defined fourth thoracic segment; both sexes having the genital segment approximately twice the length of the anal, with the caudal rami divergent and longer than the abdomen in the female, about three-fourths of its length in the male; genital segment of female inflated dorsally, that of both sexes with a medial ventral hook; exopod of leg 4 having long spines on segments 1 and 3.

Description.—FEMALE (pl. 18, figs. 1, 2): Total length about 1.10–1.18 mm. Eyes small. Metasome composing 70 percent of the total length of the body. Cephalic segment more or less distinctly separated from thorax, equaling almost half of the total length of the metasome. First thoracic segment overlying the second a considerable amount; the latter with a lateral hyaline flange ending in a pointed tip. Wing of third segment broad, acutely pointed, reaching just beyond the middle of the genital segment in dorsal view, inside margin with a spinous point near the middle. Fourth thoracic segment entirely demarcated from third, wing with a rather large spinous tip. Fifth segment hardly visible dorsally.

Urosome composing 30 percent of total length of body. Genital segment about twice the length of the anal, caudal rami longer than both segments combined; proportional length of segments, lateral view, ventral side: approximately 22:11:44. Genital segment (pl. 18, fig. 4) considerably inflated dorsally; distal margin with a fringe of small spinules ventrally; medial ventral hook small; genital opening with a long plumose seta, reaching just beyond the end of the anal segment. Caudal rami considerably divergent; with a lateral seta distally and a terminal row of spinules; caudal setae 3 (pl. 18, fig. 3), none as long as the ramus, the shortest spiniform, toothed on one margin; the others slender setae, of which the inner is the longer.

First antenna having the first two segments broad, the others slenderer; the fourth segment the longest, the terminal the shortest. Segment 1 with two short setae. Second segment with eight setae, two of which are as long as the segment is wide, and four of which reach to the apex of the appendage. Segment 3 with two stalked setae reaching beyond the terminus of the appendage. Fourth seg-

ment with one long stalked seta and a pedicel bearing two short ones. Fifth segment with a long seta distad on each side, that of the outer side accompanied by a much shorter one. Terminal segment with one short lateral, two long subterminal, and two long terminal setae.

Second antenna (pl. 18, fig. 7) having the basal segment about half the length of the second, its spine about one-fifth longer than the second segment, minutely serrate. The second segment half as wide as long; with a small lobe at its inside basal margin; its spine on a short pedicel, also minutely serrate on inner margin; inflated lamella-like inner portion with a stout, outer spinous process and a more rounded projection inside. Seta like processes of third segment obliquely truncated at ends, each bearing a minute hair subterminally; accessory claw stout, but not reaching to end of segment, three-fifths of the length of the terminal claw, a very small spinous process at its base. Terminal claw only slightly shorter than the spine of second segment, and a little shorter than the third segment.

Terminal inside spines of exopods of legs 1-3 comparatively straight; that of leg 1 set at a very slight angle and having two foliate structures between it and the shorter outside spine; setae shorter than the terminal inside spine. Terminal spine of exopod of second leg (pl. 18, fig. 6) hardly curved, inside margin with long, fine hairs; serrate outer flange not reaching to distal end and not continued across the spine to inner edge; terminal seta a little longer than the spine. Terminal spine of exopod of third leg very straight, longer than the third segment, proportions of spine to segment about 11:8; inside setae reaching a little beyond the spine.

Leg 4 (pl. 18, fig. 5) with the exopod approximately as long as the second basipod segment is wide. Top of second basal segment with a small central hump, set marginally with fine hairs; inside protuberance a comparatively large, well-rounded lobe. Segment 1 of exopod very narrow and long, about three-fourths as long as segments 2 and 3 combined; proportional lengths of segments, outer edge: approximately 27:15:20. Spines of segments 1 and 3 long, nearly equal to one another, that of segment 1 reaching at least to the distal end of the second segment. The five inner setae of the third segment all laterally placed, the sixth much broader at the base, in a terminal position, the apex and seta indistinctly demarcated from the rest of the segment (pl. 18, fig. 5, *a*). (The figures of M. Dahl, 1912, show variation from this usual pattern in a few species of *Ditrichocorycaeus*.)

MALE (pl. 18, figs. 12, 13): Total length 0.93 to 1.0 mm., Proportions of metasome to urosome approximately 73:27. Division of cephalic and first thoracic segments more or less discernible. First

thoracic segment overlying second as in female. Second thoracic segment with the lateral hyaline flange having larger tips than in the female. Wing of third segment reaching to about the middle of the genital segment, inside margin rounded at the center, without a spinous point as in the female; fourth segment separated dorsally, the distal processes usually extending a little beyond the basis of the abdomen, tipped with short spines. Fifth segment somewhat visible dorsally. Eyes larger than those of female.

Urosome very slender; proportions of genital and anal segments 2 to 1 as in female, but segments relatively longer and the caudal rami relatively shorter; approximate proportions, lateral view, ventral side: 26:13:30. Ventral hook of genital segment large (pl. 18, fig. 11); lobed genital flaps with two rows of fine hairs on the surface, the seta long, nonplumose, accompanied inside by a stout median spine and a short process with a broadened base (pl. 18, fig. 10). Caudal rami about three-fourths the length of the abdomen, with a short lateral seta distally; terminal setae 3 (pl. 18, fig. 14), the inner the longest, stout and spiniform, equaling the ramus in length and adding to the superficial appearance of great length of the urosome; the outer also spiniform, about one-fourth as long as the inner; the third slightly longer, slender and sinuous, placed subterminally near the dorsal inner edge.

Second antenna (pl. 18, fig. 8) with the basal segment about half the length of the second; its spine finely serrate and about as long as the second segment. Lamina on inner margin of second segment with a stout outer spinous process, the central portion of the lamina very thin, but produced into a second spinous projection; surface of segment near middle with a row of minute teeth, hardly visible except at high magnification; spine with stout barbules which are most thickly set in the central portion. Third segment with the basal process very slender, its tip divided, reaching about to the end of the segment. Accessory claw stout basally, otherwise very slender, reaching by almost half its own length beyond the base of the terminal claw; its tip also divided; a secondary spine, with a 3-pronged apex, at its base. Terminal claw stout, blunt ended, slightly exceeding in length the two basal segments combined.

Exopod of first leg (pl. 18, fig. 9) having the distal part of the terminal inside spine a little recurved, but the whole directed inward, the apex of the segment being incised centrally for a short distance, the resulting two portions having each a hyaline, foliate structure inside; this whole condition suggested in the female, but much more strongly developed in the male. The hyaline flanges of the outer margin of the segment minutely serrate; that of the distal portion rather short due to the excessive development of the distal

spinous process. Setae short, not reaching to the distal end of the terminal inside spine.

Leg 4 like that of the female, except that the inside protuberance of the second basal segment is not quite so large, the outer margin lacks the setose hump, and the first exopod segment is wider, with its spine reaching a little beyond the distal end of the second segment.

Remarks.—This species occurred in the Beaufort and Gulf of Mexico collections with *Corycaeus amazonicus* F. Dahl. The two are apparently the chief representatives of the subgenus *Ditrichocorycaeus* on the American Atlantic coast. *C. amazonicus* was originally described from near the mouth of the Amazon River, and M. Dahl (1912) has reported it farther south along the Brazilian coast and from the coastal waters of the Tortugas and Bermuda Islands. *Corycaeus lubbockii* Giesbrecht, with which C. B. Wilson confused *C. americanus*, has been shown by M. Dahl (1912) and Gurney (1927) to be an Indo-Pacific form of the subgenus.

C. amazonicus and *C. americanus* are similar in size and in certain distinguishing characters of the appendages. They are the only species of the subgenus having the terminal portion of the exopod of the male first leg incised, and the inside spine thus set somewhat at an angle; this is most pronounced in *amazonicus*. Likewise, they alone have the spines of the first and third segments of the exopod of the fourth leg so elongate. In the male of *C. amazonicus*, this condition is apparently somewhat variable, some specimens examined having the spine of the first segment reaching well beyond the middle of the third segment. The arrangement of the setae of the third segment of the fourth leg is also similar in the two species, but they differ in having the protuberance of the second basal segment scarcely developed in *C. amazonicus*, and in the relative proportions of the segments of the exopod—in *C. amazonicus* the second and third segments are subequal.

Both females of the two species have the genital segment inflated dorsally but are easily distinguished from one another by the relative proportions of the abdominal segments and caudal rami. The genital and anal segments of *C. amazonicus* are approximately equal (the anal only a little longer in lateral view), and the caudal rami are only slightly longer than the anal segment. In addition, the wings of the third thoracic segment are exceptionally long, reaching to the distal end of the genital segment. In the male of *C. amazonicus*, the anal segment is about two-thirds the length of the genital, and the caudal rami are slightly longer than the anal segment.

The proportions of the two segments of the abdomen of *Corycaeus americanus* approach most closely those of the females of *C. africanus* F. Dahl and *C. farrani* Fruchtl. Both of these species are also dis-

tinguished by having long caudal rami; in each instance, however, they do not attain the length of the abdomen. *Corycaeus americanus* differs not only from these species, but from all other species of the subgenus known to me, in having the caudal rami of the female longer than the two abdominal segments combined.

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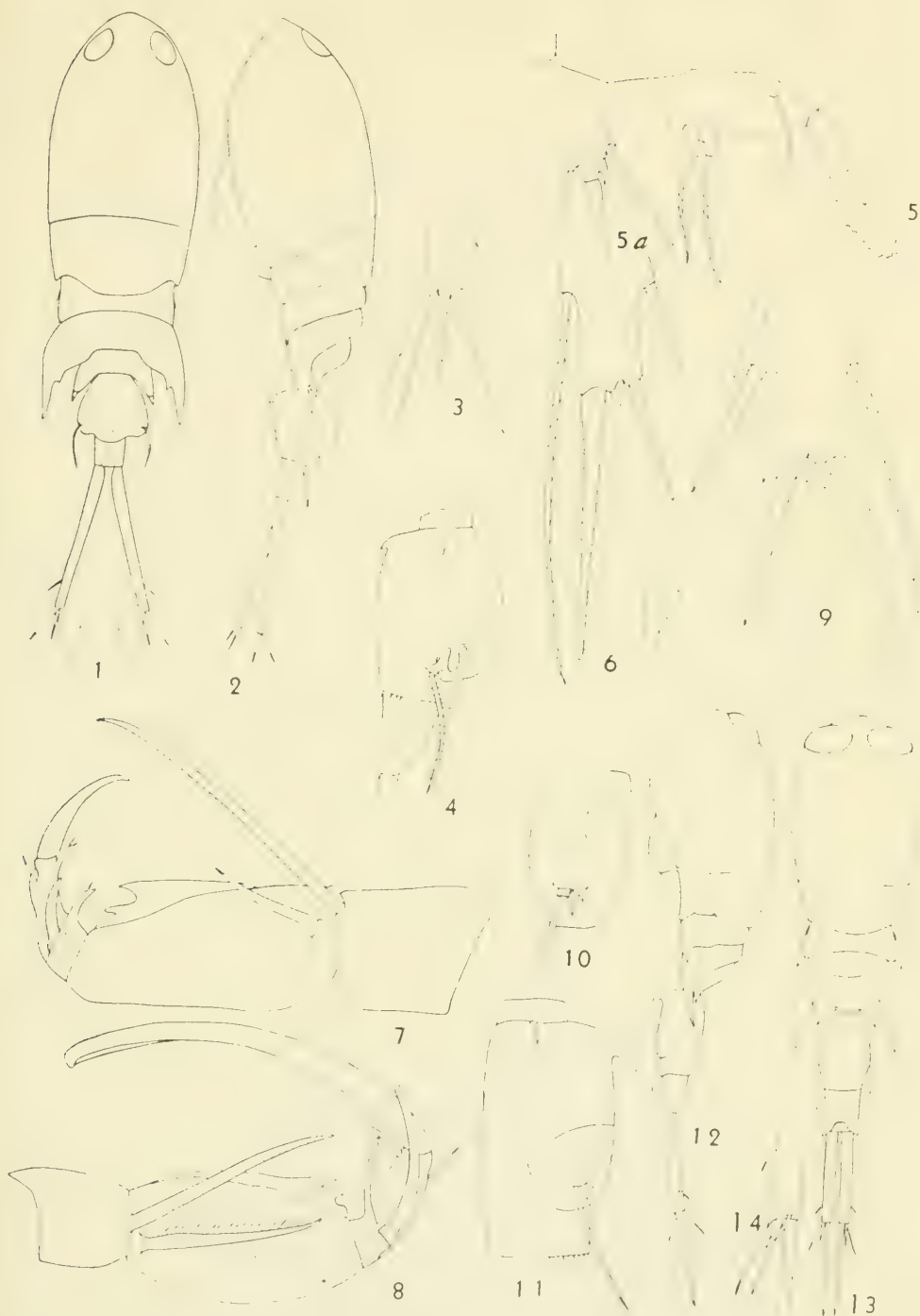
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Corycaeus americanus, new species. FEMALE: 1, Dorsal view; 2, lateral view; 3, terminal portion of caudal ramus, dorsal view; 4, detail of abdomen and fifth thoracic segment with leg 5, lateral view; 5, leg 4; 5a, detail (oil immersion) of terminal portion of exopod 3, leg 4; 6, leg 2, terminal portion of exopod 3, with detail (oil immersion) of apex of inner terminal spine; 7, second antenna (oil immersion). MALE: 8, Second antenna (oil immersion); 9, leg 1, terminal portion of exopod 3; 10, genital flap, ventral view (oil immersion); 11, genital segment and fifth thoracic segment with leg 5, lateral view; 12, lateral view; 13, dorsal view; 14, terminal portion of caudal ramus, dorsal view.



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NEW BUPRESTID BEETLES FROM MEXICO, CENTRAL
AND SOUTH AMERICA, AND THE WEST INDIES

By W. S. FISHER

A STUDY has been made of new buprestid beetles that have accumulated in the collection of the United States National Museum. Specimens have been received at various times for identification, many of which are undescribed forms, and they are described in this paper so that names will be available for use in economic studies. Twenty species in eight genera are herein described as new.

Genus **POLYCESTA** Solier

POLYCESTA CAMPOSI, new species

Female.—Elongate, broadly rounded in front and behind, moderately convex above, uniformly black, with distinct greenish or purplish reflections in different lights, and the bottom of the punctures sometimes cupreous; body beneath more strongly shining than above, greenish black, with a distinct purplish or cupreous tinge, and the tarsi violaceous-blue.

Head in front slightly depressed and uneven, densely, coarsely, confluent punctate, sparsely clothed with moderately long, semi-erect, inconspicuous hairs; epistoma shallowly emarginate in front.

Pronotum strongly transverse, twice as wide as long, slightly narrower in front than behind, widest just behind middle; sides strongly obtusely angulated just behind middles, strongly, obliquely converging anteriorly and posteriorly; anterior margin truncate, without a median lobe; base nearly truncate, feebly lobed in front of scutellum; disk broadly, rather deeply depressed at middle; surface coarsely, deeply, irregularly punctate, the punctures more or less confluent toward sides, intervals irregular in shape shining on anterior part,

opaque along base, and sparsely, irregularly clothed with short, inconspicuous hairs. Scutellum smooth, round, or oblong.

Elytra slightly wider than pronotum at base; humeral angles obtusely angulated or broadly rounded; sides nearly parallel from bases to apical thirds, then arcuately converging to the tips, which are conjointly broadly rounded, the margins coarsely serrate near apices. Each elytron with four or five more or less distinct longitudinal costae; presutural costa when present, extending from base to basal fourth; two distinct median costae extending from base to apex, and expanded toward base; two more or less distinct prelateral costae, the inner one distinct at middle, interrupted anteriorly and posteriorly, the outer one only distinctly elevated toward apex; with 10 rows of coarse, deep, distinctly separated punctures arranged in double rows between the costae; intervals between costae more or less rugose basally, finely, sparsely, irregularly punctate, and with a few short inconspicuous hairs.

Abdomen beneath finely, densely punctate, confluent toward sides, rather densely clothed with short, recumbent, whitish hairs; intervals smooth and shining; first sternite slightly flattened and vaguely punctate at middle; last visible sternite broadly rounded at apex. Prosternum strongly convex; slightly gibbose on each side along anterior margin, coarsely, deeply punctate, the punctures coarser and confluent toward sides, rather densely clothed with moderately long, recumbent, whitish hairs; anterior margin slightly elevated, feebly, broadly emarginate; prosternal process smooth, sparsely, finely punctate, without marginal grooves, sides obliquely converging to apex, which is narrowly rounded.

Male.—Differs from the female in being smaller, in having the first abdominal sternite finely, densely punctured, and the last visible abdominal sternite narrowly rounded at the apex.

Length 11–25 mm., width 4.5–9.75 mm.

Type locality.—Guayaquil, Ecuador.

Type, allotype, and paratypes.—U. S. N. M. No. 58782.

Described from 48 specimens (1 type). The type, allotype, and 42 paratypes were collected at the type locality by F. Campos R.; three paratypes were collected at the same locality during 1915 by W. F. Goding; and one paratype was collected in the vicinity of Piurat, Peru, during February 1940, by J. Soukup.

This species is very closely allied to *Polycesta velasco* Castelnau and Gory, but it differs from the description given for that species (described from Mexico) in having the sides of the pronotum angulated behind the middle and the surface rather deeply depressed at the middle, the elytron with only two longitudinal costae extending from the base to the apex, and the first abdominal sternite of the male without a densely pubescent spot at the middle.

POLYCESTA BRUNNEIPENNIS, new species

Female.—Broadly elongate, broadly rounded in front and behind, moderately convex above; head, pronotum, scutellum, and underside of body black, elytra reddish brown, usually with the longitudinal costae blackish.

Head in front flat, without depressions, coarsely, deeply, confluent punctate, sparsely clothed with short, erect, inconspicuous hairs; epistoma broad, truncate in front.

Pronotum strongly transverse, twice as wide as long, distinctly narrower in front than behind, widest at basal third; sides strongly diverging from apical angles to basal thirds, where they are obtusely angulated, then obliquely converging to posterior angles, which are rectangular; anterior margin deeply, arcuately emarginate, with a feeble, broadly rounded median lobe, and the margin smooth and narrowly elevated; base sinuate, with the median lobe feebly, broadly rounded; disk with a broad, shallow, median depression; surface densely, coarsely, deeply punctate, punctures more or less confluent toward sides, each puncture with a short, inconspicuous hair, the intervals smooth. Scutellum small, nearly round, smooth.

Elytra slightly wider than pronotum at base; humeral angles broadly rounded; epipleural lobes not dentate at apices; sides nearly parallel anteriorly, broadly expanded behind middles, then arcuately converging to the tips, which are acute, the margins slightly serrate near apices. Each elytron with five longitudinal costae, the presutural costa extending from base to basal third; two distinct median ones extending from base to apex; and two more or less distinct prelateral costae interrupted anteriorly and posteriorly, and with nine rows of coarse punctures arranged in double rows (except lateral row) between the costae, the punctures deep and variable in size; intervals very sparsely, finely, irregularly punctate, with a few very short, inconspicuous hairs.

Abdomen beneath rather densely, finely punctate, sparsely clothed with short, recumbent hairs; intervals smooth and shining; first sternite strongly convex at middle; last visible sternite narrowly rounded at apex. Prosternum strongly convex, coarsely punctate, more or less confluent toward sides, sparsely clothed with short, recumbent hairs; anterior margin truncate, feebly elevated; prosternal process short, broad, nearly flat, without marginal grooves, sides nearly parallel to behind coxae, broadly rounded at apex.

Male.—Differs from the female in being usually smaller, slenderer, and in having a densely punctured and pubescent spot on the median part of the first abdominal sternite.

Length 16–23 mm., width 6–9 mm.

Type locality.—Barranquilla, Colombia.

Type, allotype, and paratypes.—U.S.N.M. No. 58783.

Described from five specimens (one type). The type and one paratype were collected at the type locality July 10, 1935, and January 8, 1938, by Brother Gines; one paratype was collected at Río Magdalena, Colombia, during January or February, boring in a telephone pole, by F. Luis Gallego; and the allotype and one paratype were collected in British Honduras, during June 1911, by N. K. Bigelow.

This species resembles *Polycesta perlucida* Kerremans, but it differs from that species in being larger and broadly elongate, in having the head flat in front without a median carina, the pronotum more strongly expanded at the basal third and the surface more coarsely and deeply punctured, and the elytra uniformly reddish brown with distinct prescutellar costae.

Genus TYNDARIS Thomson

TYNDARIS DEPRESSICOLLIS, new species

Elongate, rather robust, subcylindrical, rather strongly shining, brownish black, with distinct purplish, greenish, bluish, and coppery reflections in different lights, and each elytron ornamented with yellow markings as follows: A round and an elongate spot at base, a round spot at humeral angle, a large spot in front of middle along sutural margin, sometimes joined to a narrow, arcuate vitta extending backward from lateral margin at basal fourth to middle of disk behind middle, and a zigzag fascia at apical third, joined at middle to a narrow, arcuate vitta extending backward to near apex and sutural margin.

Head flat in front, longitudinally carinate on vertex and occiput, without a median depression, coarsely, deeply, rather densely punctate on front, more shallowly, confluent punctate on occiput, sparsely clothed with moderately long, recumbent, whitish hairs; intervals smooth; epistoma deeply, angularly emarginate in front; antenna serrate beginning with sixth segment.

Pronotum strongly convex, slightly gibbose toward base, slightly wider than long, slightly narrower at apex than at base, widest at middle; sides strongly arcuately rounded; lateral margin when viewed from side entire and strongly arcuate; base truncate on each side, the median lobe strongly produced and feebly emarginate in front of scutellum; disk with a deep, elongate-triangular depression, the depression wide at middle becoming narrower toward anterior margin, and with a vague, oblique depression on each side near apical angles; surface coarsely, confluent punctate toward sides, finely, densely scabrous on each side of median depression, sparsely, irregularly clothed with short, recumbent, white hairs. Scutellum small and round.

Elytra at base as wide as pronotum at base; sides nearly parallel from bases to behind middles, then arcuately converging to the tips, which are broadly truncate, each with a distinct serrate preapical carina and armed at each angle with large tooth; lateral margin thick, armed posteriorly with two rows of broad teeth; disk strongly convex, slightly uneven; surface finely, shallowly striate, densely, finely and coarsely, irregularly punctate, sparsely clothed with short, recumbent, scalelike, white hairs, each elytron with an elongate, smooth, impunctate space along sutural margin extending from basal fifth to apex.

Abdomen beneath finely, densely, uniformly punctate, impunctate along posterior margins of sternites, densely, uniformly clothed with moderately long, recumbent and semierect, white hairs; posterior margin of second sternite broadly lobed at middle; last visible sternite broadly depressed, and acutely angulated at apex, with a finely, densely toothed preapical carina.

Length 10.5 mm., width 4 mm.

Type locality.—Argentine Republic (no definite locality).

Type.—U. S. N. M. No. 58784.

Described from a single specimen intercepted at New York, March 21, 1936, in a shipment of grapes from Argentine Republic.

This species is allied to *Tyndaris planata* Castelnau and Gory, but it differs from that species in having the pronotum deeply and triangularly depressed on the disk, and uniformly brownish black, and the elytra more deeply striate, with distinct zigzag yellow markings.

TYNDARIS UNICOLOR, new species

Short, robust, strongly shining, uniformly brownish black, with distinct purplish, greenish, and bronzy reflections in different lights, and with last tergite and margins of last visible sternite bluish.

Head flat in front, without depressions or median carina, densely, rather finely, uniformly punctate, sparsely clothed with moderately long, recumbent, whitish hairs; intervals smooth; epistoma deeply, arcuately or angularly emarginate in front; antenna serrate beginning with sixth segment.

Pronotum moderately convex, one-third wider than long, distinctly narrower at apex than at base, widest behind middle; sides strongly arcuately rounded, more strongly converging anteriorly; lateral margin when viewed from side entire and slightly arcuate; base nearly truncate, feebly, acutely angulated in front of scutellum; disk broadly, shallowly depressed at middle; surface finely, densely, uniformly punctate, more or less rugose, nearly glabrous at middle, densely clothed at sides, with short, recumbent, white hairs. Scutellum very small and round.

Elytra at base as wide as pronotum at base; sides parallel from bases to middles, then arcuately converging to the tips, which are separately broadly rounded or subtruncate; lateral margins not serrate, but with a large tooth near apices; disk moderately, uniformly convex; surface more or less distinctly, longitudinally costate, coarsely, densely punctate, the punctures arranged in double rows between the costae, rather densely, irregularly clothed with short, recumbent, whitish hairs.

Abdomen beneath finely, densely, uniformly punctate, impunctate along posterior margins of sternites, densely, uniformly clothed with moderately long, recumbent and semierect, white hairs; posterior margin of second sternite truncate; last visible sternite depressed on each side of middle, and terminating in an acute spine.

Length 8.5–10.5 mm., width 3.5–4.5 mm.

Type locality.—Piura, Peru.

Type and paratype.—U.S.N.M. No. 58785.

Described from two specimens (one type). The type was collected at the type locality and the paratype was collected at Lullana, Peru, both by C. H. T. Townsend.

This species is allied to *Tyndaris marginella* Fairmaire, but it differs from that species in being uniformly brownish black, without any yellow spots, and in having the elytra distinctly costate with the coarse punctures arranged in double rows between the costae.

TYNDARIS REEDI, new species

Short, robust, rather strongly shining; head and pronotum cupreous, the latter with five small, round equally spaced orange-red spots along anterior margin; elytra black with a vague brownish tinge, and each elytron ornamented with four or five small orange-red spots, two at base, one at humeral angle, one at middle equally distant from sutural and lateral margins, and sometimes one at apical third a short distance from sutural margin; body beneath black, with distinct purplish, greenish, or bronzy reflections in different lights.

Head feebly, uniformly convex, longitudinally carinate on vertex and occiput, without a median depression; surface coarsely, densely punctate on front, confluent punctate on occiput, sparsely clothed with short, recumbent, whitish hairs; intervals smooth; epistoma broadly, shallowly, arcuately emarginate in front; antenna serrate beginning with fifth segment.

Pronotum very strongly, uniformly convex, slightly wider than long, distinctly narrower at apex than at base, widest at middle; sides strongly arcuately rounded; lateral margin when viewed from side entire and slightly arcuate; base sinuate on each side, the median lobe strongly produced and vaguely emarginate in front of scutellum;

disk narrowly, longitudinally depressed from middle to base, the depression carinate at bottom and broader posteriorly; surface finely, confluent punctate toward margins, finely rugose at middle, very sparsely clothed with short, inconspicuous hairs. Scutellum large and nearly square.

Elytra at base slightly wider than pronotum at base; sides parallel anteriorly, broadly, feebly expanded at middles, then arcuately converging to the tips, which are separately broadly rounded or subtruncate; lateral margins coarsely, irregularly serrate posteriorly; disk moderately convex, broadly depressed behind scutellum, and each elytron with an elongate depression at lateral declivity extending from near humeral angle to behind middle; surface finely, shallowly striate, densely, finely and coarsely, irregularly punctate, with a few very short inconspicuous hairs toward apices.

Abdomen beneath coarsely, densely, uniformly punctate, the punctures elongate on basal sternites, impunctate along posterior margins of sternites, sparsely, irregularly clothed with short, recumbent, inconspicuous hairs; posterior margin of second sternite truncate; last visible sternite deeply depressed and acutely angulated at apex.

Length 12 mm., width 5 mm.

Type locality.—Elqui, north Chile.

Type.—U.S.N.M. No. 58786.

Described from a single specimen collected during 1937, by Dr. Edwyn P. Reed.

This species is allied to *Tyndaris planata* Castelnau and Gory, but it differs from that species in having the pronotum more strongly convex, with an elongate median depression on the disk and with five small, orange-red spots along the anterior margin, the elytra more deeply striate and more densely punctured, and each elytron with four or five orange-red spots.

Genus ACMAEODERA Eschscholtz

ACMAEODERA RURICOLA, new species

Narrowly elongate, subcylindrical, strongly convex above, broadly rounded in front, strongly narrowed behind middle, dark brown, with a distinct aeneous or cupreous tinge, and each elytron ornamented with yellow as follows: A broad band along lateral margin extending to middle of disk, the inner margin of band very irregular and interrupted at various places, and the band interrupted in apical region by a small spot and transverse, brown fascia.

Head flat in front, broadly, shallowly, longitudinally depressed between the eyes, shallowly, transversely depressed behind clypeus, coarsely, shallowly, confluent ocellate-punctate, sparsely clothed with long, erect, inconspicuous hairs; clypeus broadly, deeply, arcu-

ately emarginate in front. Antenna extending to middle of pronotum; segment 1 elongate, as long as following 3 segments united; segment 2 globose; segments 3 and 4 slightly longer than wide; segments 5-11 compact, strongly transverse, twice as wide as long, and subequal in length and width to one another.

Pronotum twice as wide as long, distinctly narrower at apex than at base, widest in front of middle; sides broadly rounded anteriorly, more strongly converging posteriorly, with the margins narrow and visible anteriorly from above; disk moderately convex above, narrowly, transversely depressed on each side along anterior margin, broadly, shallowly depressed at middle on basal half, with a broad, oblique depression on each side extending forward from base to middle near lateral margin; surface coarsely, confluent alveolate-punctate toward sides, and sparsely clothed with long, erect, inconspicuous hairs.

Elytra moderately convex, transversely flattened along base, at base slightly wider than pronotum at base; sides nearly parallel along basal halves, then arcuately converging to the tips, which are conjointly broadly rounded; lateral margins coarsely serrate behind middles. Surface rather densely, irregularly punctate basally, striately punctate posteriorly, striae deeply impressed toward apices, the punctures in the striae separated from one another by about one-half their own widths; interstrial spaces on sutural regions slightly convex, two to three times as wide as the strial punctures, wider and more strongly convex toward sides, rather coarsely, sparsely, regularly punctate, with a moderately long, fine, erect, white hair arising from each puncture.

Abdomen beneath finely, densely punctate, more sparsely punctate on basal sternites, rather densely clothed with moderately long, fine, erect and recumbent, white hairs; intervals indistinctly granulose; last visible sternite broadly rounded at apex, without a subapical carina. Prosternum coarsely, densely, deeply punctate at middle, coarsely ocellate-punctate at sides, rather densely clothed with long, fine, semierect, white hairs; anterior margin emarginate.

Length 7 mm., width 2.4 mm.

Type locality.—Río Balsas, Guerrero, Mexico.

Type.—U. S. N. M. No. 58787.

Described from a single specimen collected August 16, by H. F. Wickham.

This species belongs to Horn's Emarginatae group. It is allied to *Aemacodera horni* Fall but differs from the description given for that species by being smaller, and of a uniformly dark brown color, and in having the upper surface of the body clothed with white hairs, the pronotum at the middle distinctly wider than the elytra, obliquely

depressed on each side, and densely, uniformly punctured, and the fifth interstrial spaces on the elytra not elevated.

ACMAEODERA UNICOLOR, new species

Narrowly elongate, subcylindrical, strongly convex above, broadly rounded in front, strongly narrowed behind middle, moderately shining, uniformly coppery brown, with a faint aeneous tinge on underside of body.

Head slightly convex in front, transversely depressed behind clypeus, coarsely, confluent ocellate-punctate, sparsely clothed with short, broad, erect, white hairs; clypeus broadly, deeply, arcuately emarginate in front. Antenna extending to apical third of pronotum; segment 1 elongate, as long as following three segments united; segment 2 globose; segments 3–5 narrower, slightly longer than wide, and subequal in length to each other; segments 6–10 compact, twice as wide as long; segment 11 round.

Pronotum one and one-half times as wide as long, narrower at apex than at base, widest at middle; sides broadly rounded, with the margins narrow and scarcely visible from above; disk strongly, uniformly convex, without distinct depressions, but with a deep, elongate fovea on each side along base near posterior angle; surface deeply, coarsely, densely punctate at middle, deeply, confluent alveolate-punctate or arcuately rugose toward sides, and sparsely clothed with short, broad, erect, white hairs.

Elytra strongly convex, deeply transversely depressed along base at middle, at base subequal in width to pronotum at base; sides slightly constricted in front of middles, then arcuately converging to the tips, which are conjointly broadly rounded; lateral margins feebly serrate behind middle. Surface rather deeply striately punctate, the punctures in the striae large, separated from one another by about one-half their own widths; interstrial spaces on sutural regions flat and twice as wide as the strial punctures, wider and slightly convex toward sides, rather densely, finely, regularly, punctate, with a short, broad erect, white hair arising from each puncture.

Abdomen beneath densely, finely, shallowly punctate, densely clothed with short, rather broad, erect, white hairs; intervals smooth; last visible sternite broadly rounded at apex, without a subapical carina. Prosternum coarsely, sparsely, rather deeply punctate at middle, coarsely ocellate-punctate at sides, nearly glabrous; anterior margin truncate.

Length 5.5–6 mm., width 1.75–2 mm.

Type locality.—Tehuantepec, Oaxaca, Mexico.

Type and paratype.—U.S.N.M. No. 58788.

Described from two specimens (one type) collected June 30 by Frederick Knab.

This species belongs to Horn's *Truncatae* group. It differs from all the described American species of this group in being uniformly coppery brown.

ACMAEODERA NEONEGLECTA, new species

Narrowly elongated, subcylindrical, strongly convex above, broadly rounded in front, strongly narrowed behind middle, moderately shining, dark brown, with a distinct cupreous tinge, especially on pronotum, head, and underside of body, and each elytron ornamented with yellow as follows: The lateral margin from near humeral angle to apex, an irregular, more or less square spot behind humerus, an irregular, narrow vitta on disk extending from middle to apical fifth and connected to lateral margin at middle and apical fifth, and with two small, round spots arranged longitudinally behind middle near sutural margin.

Head slightly convex in front, not distinctly depressed behind clypeus, coarsely, shallowly, confluent ocellate-punctate, sparsely clothed with moderately long, rather broad, semierect, white hairs; clypeus broadly, shallowly, angularly emarginate in front. Antenna extending to middle of pronotum; segment 1 elongate, as long as following two segments united; segment 2 globose; segments 3 and 4 narrower, distinctly longer than wide, and subequal in length to each other; segments 5-10 not very compact, more or less triangular, slightly wider than long; segment 11 round.

Pronotum twice as wide as long, slightly narrower at apex than at base, widest at middle; sides broadly rounded, with the margins narrow and visible from above; disk strongly, uniformly convex, without distinct depressions, but with three small indistinct foveae along base, one median and one on each side toward posterior angle; surface coarsely, deeply, densely punctate at middle, confluent alveolate-punctate toward sides, and rather densely clothed with moderately long, rather broad, erect, white hairs.

Elytra strongly convex, deeply, transversely depressed along base at middle, at base subequal in width to pronotum at base; sides nearly parallel along basal halves, arcuately converging posteriorly to the tips, which are conjointly broadly rounded; lateral margins rather coarsely serrate toward apices. Surface rather deeply striately punctate, the punctures in the striae oblong, separated from one another by about one-half their own widths; interstrial spaces on sutural regions flat, and two to three times as wide as the strial punctures, wider and slightly convex toward sides, sparsely, finely regularly punctate, with a short, rather broad, erect, white, hair arising from each puncture.

Abdomen beneath rather sparsely, uniformly, finely, shallowly punctate, rather sparsely clothed with moderately long, rather broad, semierect, white hairs; intervals finely granulose; last visible sternite broadly rounded at apex, without a subapical carina. Prosternum coarsely, sparsely, deeply punctate at middle, ocellate-punctate at sides, sparsely clothed with short, rather broad, semierect, white hairs; anterior margin truncate.

Length 5.5 mm., width 1.5 mm.

Type locality.—Mexico, no locality given.

Type.—U.S.N.M. No. 58789.

Described from a single specimen collected at Brownsville, Tex., December 21, 1937, in mesquite (*Prosopis* sp.) from Mexico.

This species belongs to Horn's *Truncatae* group. It is very closely allied to *Acmaeodera neglecta* Fall, but it differs from that species in being more cylindrical, more strongly acuminate posteriorly, and more strongly shining, and in having the strial punctures on the elytra finer and more elongate, and the interstrial spaces two to three times as wide as the strial punctures.

ACMAEODERA KNABI, new species

Narrowly elongate, subcylindrical, strongly convex above, broadly rounded in front, strongly narrowed posteriorly, rather strongly shining; head, pronotum, and underside of body coppery brown, the latter with a distinct aeneous tinge; elytra bluish black, with a distinct violaceous tinge, and each elytron ornamented with six small yellow spots arranged longitudinally, three along lateral margin and three on disk.

Head flat in front, slightly depressed between eyes, transversely flattened behind clypeus, with a narrow, longitudinal carina on vertex and occiput, coarsely, shallowly, confluent alveolate-punctate, sparsely clothed with long, erect, white hairs; clypeus broadly, deeply, arcuately emarginate in front. Antenna extending to base of pronotum; segment 1 elongate, as long as following three segments united; segment 2 globose; segments 3 and 4 narrower, twice as long as wide; segments 5–10 not compact, triangular, about as wide as long; segment 11 oval.

Pronotum one and three-fourths times as wide as long, narrower at apex than at base, widest at middle; sides broadly rounded, with the margins narrow, but not visible from above; disk strongly convex, narrowly, transversely flattened along anterior margin, feebly, longitudinally grooved at middle, with three small foveae along base, one median and one on each side near posterior angle; surface densely, coarsely, deeply, uniformly punctate, the punctures confluent toward sides, and rather densely clothed with short, erect, inconspicuous hairs.

Elytra strongly convex, transversely depressed along base at middle, at base subequal in width to pronotum at base; sides broadly constricted at basal fourths, then gradually converging to the tips, which are conjointly narrowly rounded; lateral margins coarsely serrate along apical fourths. Surface striately punctate, the punctures in the striae separated from one another by about their own widths; interstrial spaces on sutural regions flat, about as wide as the strial punctures, wider and slightly convex toward sides, sparsely, coarsely, regularly punctate, with a rather long, fine, semierect, white hair arising from each puncture.

Abdomen beneath densely, finely, deeply punctate, densely clothed with long, fine, erect and recumbent, white hairs; intervals smooth; last visible sternite broadly rounded at apex, without a subapical carina. Prosternum coarsely, rather densely, deeply punctate at middle, coarsely ocellate-punctate at sides, densely clothed with long, fine, semierect, white hairs; anterior margin truncate.

Length 12 mm., width 3.25 mm.

Type locality.—Tehuantepec, Oaxaca, Mexico.

Type.—U.S.N.M. No. 58790.

Described from a single specimen collected July 2, by Frederick Knab.

This species belongs to Horn's *Truncatae* group. It is allied to *Acmaeodera wheeleri* Van Dyke, but it differs from that species in being much larger, and in having the head and pronotum black, the head slightly depressed at the middle, the pronotum transversely flattened along the anterior margin, with a longitudinal groove at the middle, the elytra with 12 yellow spots instead of 14, and the elytra and underside of the body clothed with rather long, fine, semierect, white hairs.

ACMAEODERA RUSTICA, new species

Rather broadly elongate, robust, slightly flattened above, broadly rounded in front, strongly narrowed behind middle, moderately shining above, more strongly shining beneath, black, with a faint aeneous tinge on underside of body, and each elytron ornamented with yellow markings as follows: A small, elongate spot behind humerus, a small, irregular, transverse spot along lateral margin at middle, three small spots arranged longitudinally on disk (a small spot at basal fifth, an irregular spot at middle, and a small one at apical third), and a small spot near sutural margin in apical region.

Head flat in front, broadly, shallowly depressed on vertex, slightly, transversely flattened behind clypeus, coarsely, shallowly, confluent ocellate-punctate, sparsely clothed with long, rather broad, erect, white hairs; clypeus broadly, shallowly, triangularly emarginate in front. Antenna extending to basal third of pronotum; segment 1 elongate,

as long as following three segments united; segments 2-4 globose; segments 5-10 wider, compact, scarcely triangular; slightly wider than long; segment 11 oval.

Pronotum nearly twice as wide as long, distinctly narrower at apex than at base, widest along basal half; sides parallel along basal halves, strongly, arcuately converging anteriorly, with the margins narrow, but not visible from above; disk moderately convex, narrowly, transversely flattened along anterior margin, with a broad, shallow, triangular, median depression on basal half, a broad, oblique depression on each side extending forward from base to middle near lateral margin, and trifoveolate along base; surface coarsely, deeply, densely punctate at middle, coarsely, confluent alveolate-punctate toward sides, and sparsely clothed with long, rather broad, erect, whitish hairs.

Elytra moderately convex, deeply, transversely depressed along base at middle, at base subequal in width to pronotum at base; sides nearly parallel along basal halves, then arcuately converging to the tips, which are conjointly broadly rounded; lateral margins, coarsely, serrate behind middles. Surface striately punctate, striae deeply impressed posteriorly, the punctures in the striae large, separated from one another by about one-half their own widths; interstrial spaces on sutural regions flat, and from one-half as wide to nearly as wide as the strial punctures, wider, strongly convex, and more or less interrupted toward sides, rather densely, finely, regularly punctate, with a short, rather broad, erect, white hair arising from each puncture.

Abdomen beneath rather sparsely, uniformly, finely, shallowly punctate on basal sternites, ocellate-punctate on apical sternites, sparsely clothed with short, rather broad, semierect, white hairs; intervals smooth; last visible sternite broadly rounded at apex, without a sub-apical carina. Prosternum coarsely, sparsely, deeply punctate at middle, coarsely ocellate-punctate at sides, sparsely clothed with short, rather broad, erect, white hairs; anterior margin sinuate, with two distinct, obtusely rounded, slightly produced lobes near middle.

Length 7 mm., width 2.5 mm.

Type locality.—Puente de Ixtla, Morelos, Mexico.

Type.—U.S.N.M. No. 58791.

Described from a single specimen collected by H. F. Wickham.

This species belongs to Horn's *Sinuatae* group. It resembles *Acmacodera tubulus* Fabricius very closely, but it differs from that species in having the anterior margin of the prosternum slightly lobed on each side of the middle, the pronotum obliquely depressed on each side with the sides parallel behind the middle, the strial punctures on the elytra coarse, and the interstrial spaces on the sutural regions about as wide as the strial punctures.

ACMAEODERA OAXACAE, new species

Narrowly elongate, subcylindrical, strongly convex above, broadly rounded in front, strongly narrowed behind middle, moderately shining, uniformly black, with a faint coppery or greenish tinge, and each elytron ornamented with a small, triangular, red spot at middle along lateral margin.

Head nearly flat in front, broadly, shallowly, longitudinally depressed between eyes, transversely depressed behind clypeus, coarsely, deeply, densely punctate, rather densely clothed with moderately long, erect, inconspicuous, white hairs; clypeus deeply, triangularly emarginate in front. Antenna extending to middle of pronotum; segment 1 elongate, as long as following 3 segments united; segment 2 globose; segments 3 and 4 narrower, slightly longer than wide, and subequal in length to each other; segments 5-10 somewhat triangular, slightly wider than long; segment 11 round.

Pronotum one and one-half times as wide as long, narrower at apex than at base, widest at middle; sides slightly rounded, more strongly anteriorly; slightly constricted near bases, with the margins narrow, but not visible from above; disk strongly convex, without distinct depressions, vaguely, transversely flattened along anterior margin, and with three indistinct foveae along base; surface densely, coarsely, deeply punctate, the punctures separated at middle but more or less confluent toward sides, rather densely clothed with long, erect, inconspicuous, white hairs.

Elytra strongly convex, deeply, transversely depressed along base at middle, at base subequal in width to pronotum at base; sides constricted at basal fourths, then arcuately converging to tips, which are conjointly narrowly rounded; lateral margins coarsely serrate along apical thirds. Surface striately punctate, striae deeply impressed posteriorly, the punctures in the striae large, separated from one another by about their own widths; interstrial spaces on sutural regions flat and as wide as the strial punctures, wider, slightly convex, and more or less interrupted toward the sides, sparsely, minutely, regularly punctate, with a moderately long, fine, semierect, white hair arising from each puncture.

Abdomen beneath densely, finely punctate, more sparsely punctate on basal sternites, densely clothed with long, fine, erect, white hairs, intervals smooth; last visible sternite broadly rounded at apex, without a subapical carina. Prosternum coarsely, densely punctate at middle, coarsely ocellate-punctate at sides, densely clothed with long, fine, erect, white hairs; anterior margin sinuate, with two distinct, obtusely rounded, strongly produced lobes near middle.

Length 6.5-8.5 mm., width 2-2.75 mm.

Type locality.—Tehuantepec, Oaxaca, Mexico.

Type and paratypes.—U.S.N.M. No. 58792.

Described from 10 specimens (one type) collected at the type locality, June 30–July 1, by Frederick Knab.

This species belongs to Horn's *Sinuatae* group and is closely allied to *Acmaeodera faceta* Fall, but it differs from the description given for that species in being uniformly black, with a small triangular red marginal spot at the middle of each elytron, instead of at the apical fourth, and in not having a subapical carina at the apex of the last visible abdominal sternite.

ACMAEODERA MONTICOLA, new species

Broadly elongate, robust, moderately convex above, broadly rounded in front, strongly narrowed behind middle, rather strongly shining, dark brown, with distinct cupreous and aeneous tinges; pronotum ornamented with a narrow, yellow vitta on each side along lateral margin, extending from base to apical third; each elytron ornamented with yellow as follows: Lateral margin along basal third, three irregular, strongly interrupted fasciae extending from lateral margin to near sutural margin, and four small spots on disk (three in front of middle and one near apex).

Head flat in front, deeply, broadly depressed between eyes, transversely depressed behind clypeus, coarsely, deeply, confluent alveolate-punctate, sparsely clothed with very long, erect, brownish hairs; clypeus broadly, deeply, angularly emarginate in front. Antenna extending to middle of pronotum; segment 1 elongate, as long as following three segments united; segment 2 globose; segments 3 and 4 slightly narrower and longer than 2, and subequal in length to each other; segments 5–11 compact, twice as wide as long, and subequal in length and width to one another, the fifth more or less triangular.

Pronotum twice as wide as long, distinctly narrower at apex than at base, widest at base; sides nearly parallel along basal halves, arcuately converging anteriorly, with the margin rather narrow and visible from above; disk slightly convex, broadly flattened at middle on basal half, with a narrow, oblique depression on each side extending forward from base to near apical angle; surface coarsely, deeply, uniformly punctate at middle, confluent alveolate-punctate toward sides, and sparsely clothed with long, semierect, black hairs.

Elytra moderately convex, transversely depressed along base at middle, at base subequal in width to pronotum at base; sides nearly parallel along basal halves, then arcuately converging to the tips, which are conjointly broadly rounded; lateral margins coarsely serrate along apical halves. Surface rather densely, irregularly punctate basally, striately punctate posteriorly, the punctures in the striae

small, separated from one another by about twice their own widths; interstitial spaces on sutural regions flat, about three times as wide as the stria punctures, wider and more convex toward sides, sparsely, finely, regularly punctate, with a long, fine, erect, brownish hair arising from each puncture.

Abdomen beneath finely, sparsely punctate on basal sternites, sparsely, coarsely punctate on apical sternites, sparsely clothed with long, fine, erect and recumbent, white hairs; intervals smooth; last visible sternite broadly rounded at apex, with an irregular, short subapical carina at apex. Prosternum sparsely, coarsely, deeply punctate at middle, coarsely ocellate-punctate at sides, sparsely clothed with long, fine, recumbent, white hairs; anterior margin emarginate, with two vaguely indicated, indistinct lobes near the middle.

Length 9–10 mm., width 3.5–4 mm.

Type locality.—Oaxaca, Mexico.

Type and paratype.—U.S.N.M., No. 58793.

Described from two specimens (one type) from the Wickham Collection collected September 1894, at an altitude of 5,000 feet.

This species belongs to Horn's Sinuatae group. It is allied to *Acmaeodera serena* Fall, but it differs from that species in being uniformly dark brown with a distinct coppery or bronzy tinge, and in having the head broadly depressed between the eyes and confluent punctured, the elytra clothed with long, fine, erect, brownish hairs and with the sides nearly parallel to behind the middle, the lobes on the anterior margin of the prosternum vaguely indicated, and the subapical carina on the last visible abdominal sternite irregular and very short. The markings on the elytra are variable in shape.

ACMAEODERA AENEICOLLIS, new species

Broadly elongate, cuneiform, strongly flattened above, broadly rounded in front, strongly narrowed posteriorly, strongly shining; pronotum, head, and underside of body aeneous, the pronotum ornamented with a broad, yellow spot on each side along lateral margin, extending from base to near apex; elytra black, with a distinct violaceous or greenish tinge, and each elytron ornamented with yellow as follows: The yellow markings variable but usually with a broad fascia, more or less interrupted, along lateral margin, and two broad transverse fasciae behind the middle.

Head flat in front, slightly depressed between eyes, transversely flattened behind clypeus, with a short, longitudinal carina on occiput, rather deeply, coarsely, confluent ocellate-punctate, sparsely clothed with rather long, erect, yellowish-brown hairs; clypeus broadly, rather deeply arcuately emarginate in front. Antenna extending

nearly to base of pronotum; segment 1 elongate, as long as following three segments united; segments 2 and 3 globose; segment 4 obconic, slightly longer than 3; segments 5–11 not compact more or less triangular, distinctly wider than long, and subequal in length and width to one another.

Pronotum twice as wide as long, distinctly narrower at apex than at base, widest at base; sides arcuately converging from bases to apices, the margins narrow and visible anteriorly from above; disk slightly convex, narrowly, transversely depressed on each side along anterior margin, broadly flattened toward sides, with a broad, rather deep, median, triangular depression; surface rather densely, deeply punctate, the punctures rather fine at middle becoming coarser and deeper toward sides, and sparsely clothed with rather long, erect, brownish hairs.

Elytra slightly convex, flattened on disk, at base subequal in width to pronotum at base; sides converging from bases to tips, which are conjointly broadly rounded; lateral margins finely serrate near apices. Surface striately punctate, the punctures in the striae small, and separated from one another by about their own widths; interstrial spaces on sutural regions slightly convex, and twice as wide as the strial punctures, wider toward sides, sparsely, finely, regularly punctate, with a rather long, fine erect, brownish hair arising from each puncture.

Abdomen beneath sparsely, finely punctate, sparsely clothed with long, fine, erect and recumbent, white hairs; intervals smooth; last visible sternite broadly rounded at apex, without a subapical carina. Prosternum coarsely, rather sparsely, deeply punctate at middle, coarsely, confluent ocellate-punctate at sides, sparsely clothed with short, fine, erect, white hairs; anterior margin sinuate, with two distinct, obtusely rounded, slightly produced lobes near the middle.

Length 7.5–11.5 mm., width 2.6–4.5 mm.

Type locality.—Maracaibo, Venezuela.

Type and paratypes.—U.S.N.M. No. 58794.

Described from nine specimens (one type). The type and six paratypes were collected at the type locality; one paratype from the Mason Collection was collected July 11, 1920, at the Cartagena chaparral, Bolívar, Colombia; and one paratype was collected May 13, 1938, at San Juan, Puerto Rico, in "box cuttings" from Caracas, Venezuela.

This species belongs to Horn's *Sinuatae* group. It is allied to *Acmacodera flavomarginata* Gray, but it differs from that species in having the lateral margins of the pronotum narrow, scarcely visible from above, and not narrowed near the posterior angles, with the surface strongly shining, finely punctured at the middle, and with

a broad, yellow spot along the sides, the pronotum not wider than the elytra, the interstrial spaces on the sutural regions of the elytra about twice as wide as the strial punctures, and without a subapical carina on the last visible abdominal sternite.

ACMAEODERA STRIATA, new species

Narrowly elongate, subcylindrical, strongly convex above, broadly rounded in front, strongly narrowed behind middle, strongly shining; pronotum, head, and underside of body cupreous; elytra brownish black, with a vague purplish reflection, and each elytron ornamented with yellow as follows: Lateral margin along basal half, three narrow, transversely oblique fasciae extending from lateral margin to disk, and with numerous small, irregular spots on disk and along sutural margin.

Head flat in front, without distinct depressions, coarsely, rather deeply, confluent alveolate-punctate, sparsely clothed with long, rather broad, erect, whitish hairs; clypeus broadly, shallowly, arcuately emarginate in front. Antenna extending to apical third of pronotum; segment 1 elongate, nearly as long as following three segments united; segment 2 globose; segment 3 obconic, slightly longer than 2; segment 4 wider than 3 and somewhat triangular; segments 5-11 compact, twice as wide as long, the fifth triangular and the eleventh oval.

Pronotum nearly twice as wide as long, narrower at apex than at base, widest at middle; sides strongly rounded, the margins narrow and visible from above; disk strongly convex, narrowly, transversely flattened along anterior margin, with three small indistinct foveae along base, one median and one on each side near posterior angle; surface coarsely, densely, deeply punctate at middle, confluent alveolate-punctate toward sides, and sparsely clothed with short, rather broad, erect, whitish hairs.

Elytra moderately convex, transversely depressed along base at middle, at base subequal in width to pronotum at base; sides converging from bases to tips, which are conjointly broadly rounded; lateral margins coarsely serrate near apices. Surface striately punctate, striae deeply impressed posteriorly, the punctures in the striae coarse and nearly confluent basally, posteriorly separated from one another by about their own widths; interstrial spaces on sutural regions slightly convex, about three times as wide as the strial punctures, wider and more strongly convex toward sides, sparsely, finely, regularly punctate, with a rather long, fine, erect, white hair arising from each puncture.

Abdomen beneath sparsely, finely punctate, sparsely clothed with moderately long, fine, semierect, white hairs; intervals smooth; last

visible sternite broadly rounded at apex, without at subapical carina. Prosternum coarsely, sparsely, deeply punctate at middle, coarsely, shallowly ocellate-punctate at sides, sparsely clothed with short, fine, recumbent, white hairs; anterior margin sinuate, with two indistinct, obtusely rounded, slightly produced lobes near the middle.

Length 7.5 mm., width 2.25 mm.

Type locality.—Caracas, Venezuela.

Type.—U. S. N. M. No. 58795.

Described from a single specimen collected May 13, 1938, at San Juan, Puerto Rico, in "box cuttings" from Caracas, Venezuela.

This species belongs to Horn's Sinuatae group. It is allied to *Acmaeodera meridionalis* Kerremans, but it differs from that species in being more cylindrical and in having the pronotum widest at the middle, with the sides regularly rounded, the sides of the elytra converging from the bases to the apices, the striae punctures on the elytra finer, and the interstriae spaces on the sutural regions about three times as wide as the striae punctures, and the abdominal sternites finely and sparsely punctured.

ACMAEODERA DANFORTHI, new species

Narrowly elongate, subcylindrical, slightly convex above, broadly rounded in front, strongly narrowed posteriorly, strongly shining, black, with a distinct cupreous or purplish tinge above and a feeble aeneous tinge beneath, and ornamented with yellow markings as follows. A round, median spot on head at vertex, a large triangular spot on each side of pronotum covering basal half, extending along base to near middle and obliquely forward to near apical angle, the spot not extending to base or lateral margin, and each elytron with three broad, transverse lateral spots (one at basal fourth, one at middle, and one at apical third), and an elongate, triangular spot at apex, the spots extending from lateral margin to near sutural margin.

Head nearly flat in front, coarsely, deeply, confluent punctate, and with a few short, erect, inconspicuous hairs; clypeus broadly, arcuately emarginate in front. Antenna extending to basal fourth of pronotum; segment 1 elongate, as long as following three segments united; segment 2 globose; segments 3 and 4 narrower, slightly longer than wide, and subequal in length to each other, the fourth slightly triangular; segments 5–10 compact, twice as wide as long; segment 11 oblong.

Pronotum nearly twice as wide as long, narrower at apex than at base, widest at basal third; sides broadly rounded, more obliquely anteriorly, with the margins narrowly flattened and visible from above; disk moderately convex, narrowly, transversely depressed

along anterior margin, with three small, obsolete foveae along base, one median and one on each side near posterior angle; surface coarsely, deeply, rather densely punctate, sparsely clothed with short, erect, inconspicuous hairs.

Elytra slightly flattened on disk, at base slightly narrower than pronotum at basal third; sides gradually converging from bases to tips, which are conjointly broadly rounded; lateral margins coarsely serrate posteriorly. Surface striately punctate, striae rather deeply impressed, the punctures in the striae coarse and separated from one another on the basal half by about their own widths, but becoming finer and more distant toward apices; interstrial spaces on sutural regions slightly convex, and about as wide as the striae punctures, wider and more strongly convex toward the sides, sparsely, finely, regularly punctate, with a short, fine, erect, white hair arising from each puncture.

Abdomen beneath coarsely, shallowly, rather sparsely punctate, sparsely clothed with moderately long, semierect, white hairs; intervals smooth; last visible sternite broadly rounded at apex, without a subapical carina. Prosternum coarsely, deeply, rather densely punctate at middle, coarsely ocellate-punctate at sides, sparsely clothed with long, semierect, white hairs; anterior margin slightly sinuate.

Length 6.5 mm., width 2.25 mm.

Type locality.—Hog Island, Grenada, British West Indies.

Type.—U. S. N. M. No. 58796.

Described from a single specimen collected August 1, 1935, by S. T. Danforth.

This species belongs to Horn's *Sinuatae* group. It is allied to *Acmaeodera subcylindrica* Fisher, but it differs from that species in having the pronotum shorter, more strongly expanded at the basal third, transversely depressed along the anterior margin, and with a large triangular yellow spot on each side covering the basal half, the head with a round yellow spot on the vertex, and each elytron ornamented with three transverse and one elongate yellow spots along the lateral margin. The species is named for S. T. Danforth, the collector.

Genus EUPLECTALECIA Obenberger

EUPLECTALECIA KNABI, new species

Elongate, attenuate anteriorly, acuminate posteriorly, strongly shining, bright green, more or less distinctly reddish, cupreous and brownish on pronotum and elytra, underside of tarsi yellowish, antenna blackish purple, except first three segments, which are green, and each elytron ornamented with a longitudinal row of three small, more or less distinct, purplish-black spots.

Head shallowly, broadly, longitudinally depressed, with a narrow, longitudinal groove on occiput, rather densely, coarsely, irregularly punctate. Antenna extending to base of pronotum; segments 3 to 11 narrowly elongate-triangular.

Pronotum wider than long, slightly narrower at apex than at base; sides vaguely narrowed from bases to apices, slightly divergent at posterior angles; base slightly sinuate; disk more or less uneven, with an inconspicuous round gibbosity on each side toward apical angle; surface rather densely, finely, uniformly punctate, the punctures well separated; prescutellar fovea indistinct. Scutellum impunctate, transversely oval, nearly twice as wide as long.

Elytra at base slightly wider than pronotum; sides nearly parallel from bases to behind middles, then strongly narrowed to tips, which are separately narrowly rounded and each armed with a short spine; disk feebly striate posteriorly, uneven toward sides, broadly depressed along lateral margins behind humeri; surface finely, rather densely, irregularly punctate.

Body beneath rather densely, finely, uniformly punctate, sparsely clothed with very short, recumbent, inconspicuous hairs; last visible abdominal sternite broadly, feebly, transversely sinuate at apex, and deeply grooved along apical margin.

Length 13–14.5 mm., width 4–4.75 mm.

Type locality.—Bluefields, Nicaragua.

Type and paratypes.—U.S.N.M. No. 58797.

Described from three specimens (one type). The type was collected at the type locality, April 20, 1909, by F. Knab, and the two paratypes were collected at Punta Patuca, Honduras, April 11, 1909, by the same collector.

This species is closely allied to *Euplectalecia beltii* (Saunders), but it differs from that species in being more slender, and of a brighter green color, and in having the last visible abdominal sternite broadly and transversely sinuate at the apex. The two paratypes are slightly more greenish on the dorsal surface than the type.

Genus PERONAEMIS Waterhouse

PERONAEMIS CUPRICOLLIS, new species

Broadly agriliform, broadly rounded in front, strongly narrowed posteriorly, glabrous, and rather strongly shining; head green, median part with a distinct reddish-purple tinge in different lights; pronotum reddish cupreous, with anterior and lateral margins, and a large spot at posterior angles greenish; elytra olivaceous-green, with distinct purplish reflections in different lights; body beneath uniformly bronzy green, with a distinct purplish tinge, the tarsi slightly more bluish green.

Head nearly flat; surface coarsely, deeply, uniformly, confluent punctate; epistoma wide and slightly depressed between antennal cavities, broadly, feebly, arcuately emarginate in front.

Pronotum strongly convex, strongly deflexed at sides, nearly one-third wider than long, slightly wider at base than at apex; sides nearly parallel from bases to apical sixths, then arcuately narrowed to apical angles; lateral margins when viewed from side sharply defined and sinuate; disk with three deep, oblong, basal depressions extending to middle of pronotum, the median one with a narrow, longitudinal groove at middle; surface coarsely, deeply, densely, uniformly punctate. Scutellum twice as wide as long, feebly rounded at sides, and surface smooth.

Elytra as wide as pronotum at base; sides strongly, angularly expanded behind humeral angles, broadly, feebly arcuately constricted at middles, then strongly, obliquely converging to tips, which are acute; lateral margins coarsely serrate posteriorly; basal depressions shallow, broadly transverse; surface slightly transversely rugose basally, irregularly striato-punctate, the striae slightly impressed toward apices; intervals finely, densely granulose, with a few coarse, inconspicuous punctures intermixed.

Abdomen beneath coarsely, sparsely punctate, intervals finely, inconspicuously reticulate, sparsely clothed with short, recumbent, whitish hairs; last visible sternite deeply, narrowly, arcuately emarginate.

Length 11 mm., width 3.5 mm.

Type locality.—Indiera Alta Maricao, Puerto Rico.

Type.—U. S. N. M., No. 58798.

Described from a single specimen collected June 5, 1944, by J. A. Ramos.

This species is closely allied to *Peronaemis thoracicus* Waterhouse, but it differs from that species in having the sides of the pronotum parallel posteriorly and not expanded at the bases, and the basal depressions shallower, the elytra uniformly olivaceous green without any distinct brownish or cupreous spots, and the underside of the abdomen uniformly brownish green.

Genus TAPHROCERUS Solier

TAPHROCERUS HAITIENSIS, new species

Broadly elongate, strongly attenuate posteriorly, moderately convex above, moderately shining, black, with a vague greenish or bronzy tinge in different lights.

Head subequal in width to pronotum at base, and when viewed from above truncate in front, without a distinct longitudinal groove; front wide, with a broad, shallow depression between the eyes, and with the sides nearly parallel; surface coarsely granulose, coarsely, shallowly,

irregularly punctate, clothed with a few short, inconspicuous hairs behind the epistoma, and with the two median pores along anterior margin separated from each other by the diameter of the pores; eyes large, elongate, more acutely rounded beneath than above, but not projecting; epistoma strongly elevated, broadly, deeply, arcuately emarginate in front.

Pronotum moderately convex, with a shallow, transverse depression along anterior margin, nearly twice as wide as long, subequal in width at base and apex, widest at apical third; sides when viewed from above, arcuately rounded, more strongly narrowed posteriorly; posterior angles obtusely angulated; anterior margin nearly truncate; base truncate on each side, deeply, arcuately emarginate in front of scutellum; surface nearly glabrous, coarsely granulose, coarsely, sparsely, shallowly, irregularly punctate, each puncture with a very short, recumbent, inconspicuous hair. Scutellum triangular, rounded in front.

Elytra at base as wide as pronotum at apical third; humeral angles broadly rounded; sides broadly, shallowly constricted along basal halves, then obliquely narrowed to the tips, which are separately broadly rounded and finely serrulate; surface irregularly rugose, more coarsely basally, with indistinct rows of shallow punctures, the punctures becoming obsolete toward apices, and clothed with a few short, recumbent, white hairs, and with the intervals finely granulose; each elytron with a broad, transverse basal depression.

Abdomen beneath finely granulose, coarsely, very shallowly, sparsely, irregularly punctate, with a few short, recumbent, white hairs; last sternite narrowly flattened and truncate at apex, with a deep, arcuate apical groove following outline of apical margin. Prosternum finely, densely reticulate. Anterior and middle tibiae slightly arcuate, posterior pair straight.

Length 4 mm., width 1.25 mm.

Type locality.—Lac Azuei, Haiti.

Type and paratypes.—U. S. N. M. No. 58799. Paratypes returned to J. A. Ramos and the Museum of Comparative Zoology.

Described from 84 specimens. The type and 80 paratypes were collected at the type locality during June 1938 by J. A. Ramos, by sweeping over low vegetation in a mangrove swamp; one paratype was collected at Petite Saline, Haiti, August 21, 1925, by W. A. Hoffman; and two paratypes were collected at Trou Caiman, Haiti, September 4, 1934, by P. J. Darlington.

This species is closely allied to *Taphrocerus acneocupreus* Fisher, but it differs from that species in being black with only a vague greenish or bronzy tinge, in having the head only shallowly depressed between the eyes, the epistoma strongly elevated, the pronotum convex posteriorly, and the two median pores along the anterior margin

of the head separated from each other by the diameter of the pores, whereas in *aeneocupreus*, these pores are separated from each other by from two to three times the diameter of the pores.

Genus MASTOGENIUS Solier

MASTOGENIUS PERUVIANUS, new species

Elongate, subcylindrical, strongly shining, glabrous, uniformly dark brown, with a distinct cupreous tinge.

Head broadly, very deeply depressed in front, with a deep, round fovea in the depression between eyes; surface densely, coarsely, uniformly punctate, the intervals finely granulose or reticulate; eyes with inner margins nearly parallel to each other. Antenna extending to middle of pronotum, serrate from fourth segment; second segment short, globose; third segment about twice as long as second and distinctly narrower; the following segments, short and triangular, except the eleventh, which is oblong, and acute at apex.

Pronotum regularly convex, about one and one-half times wider than long, narrower at apex than at base; sides nearly parallel or feebly sinuate; posterior angles obtuse; anterior margin and base truncate; surface densely, coarsely, uniformly punctate, the intervals indistinctly granulose. Scutellum triangular, smooth.

Elytra strongly convex, as wide as pronotum at base; sides nearly parallel from humeral angles to middles, arcuately expanded at apical thirds, then arcuately converging to the tips, which are separately broadly subtruncate; humeral angles rectangular; surface deeply, transversely depressed along bases, feebly, broadly depressed along sides behind humeri, very densely, coarsely, uniformly punctate, the intervals smooth.

Abdomen beneath strongly convex, coarsely, rather sparsely, uniformly punctate, intervals indistinctly reticulate; last sternite broadly rounded at apex, and clothed with a few inconspicuous, erect hairs. Prosternum without antennal grooves, coarsely, confluent punctate or rugose. Posterior margin of hind coxal plate straight.

Length 2.75–3.25 mm., width 1–1.25 mm.

Type locality.—Cañete, Peru.

Types and paratypes.—U.S.N.M. No. 58800.

Described from six specimens (one type) collected at the type locality, January 13, 1938, by J. E. Wille.

This species resembles *Mastogenius subcyaneus* (LeConte), but it differs from that species in being glabrous and uniformly dark brown, with a distinct cupreous tinge, and in having the front of the head deeply depressed at the middle, the sides parallel or feebly sinuate, and the anterior margin truncate, and the elytra more coarsely and uniformly punctured.

Genus **TRIGONOGYA** Schaeffer**TRIGONOGYA INSULARIS**, new species

Elongate oval, strongly shining, sparsely pubescent, black, with a distinct purplish tinge, bright blue along base of elytra, and tarsi brownish yellow.

Head convex, without a median depression; surface finely, shallowly, sparsely punctate, the intervals finely reticulate; eyes with inner margins nearly parallel to each other. Antenna extending beyond middle of pronotum (broken).

Pronotum regularly convex, twice as wide as long, distinctly narrower at apex than at base, widest at apical fourth; sides broadly, arcuately diverging from apical angles to apical fourths, then feebly, obliquely converging to the posterior angles, which are rectangular; anterior margin feebly, arcuately emarginate; base truncate; surface sparsely, finely, shallowly punctate, the intervals smooth, and sparsely clothed with rather short, semierect, inconspicuous hairs. Scutellum triangular, smooth.

Elytra strongly convex, as wide as pronotum at base; sides nearly parallel from humeral angles to behind middles, then arcuately converging to the tips, which are conjointly broadly rounded; humeral angles obtusely rounded; surface deeply, transversely depressed along bases, very finely, sparsely, indistinctly punctate, intervals smooth, sparsely clothed with very short, semierect, inconspicuous hairs.

Abdomen beneath strongly convex, finely, indistinctly punctate, finely, longitudinally reticulate, sparsely clothed with short, inconspicuous hairs; last sternite finely granulose and broadly rounded at apex. Prosternum longitudinally reticulate, with distinct, deep antennal grooves extending to middle of prosternum. Posterior margin of hind coxal plate slightly arcuate.

Length 2 mm., width 1 mm.

Type locality.—Port-of-Spain, Trinidad.

Type and paratype.—U.S.N.M. No. 58801.

Described from two specimens (one type), collected at the type locality, October 24, 1918, by Harold Morrison.

This species is allied to *Mastogenius uniformis* Waterhouse, but it differs from the description given for that species in being black, with a distinct purplish tinge, and in having the bases of the elytra bright blue and the dorsal surface of the body sparsely clothed with short hairs. Waterhouse, in his careful description of *uniformis*, does not mention any pubescence, and if the type was pubescent it is very doubtful that he had overlooked that character. *Mastogenius uniformis* Waterhouse has the antennal grooves on the prosternum and should be placed in the genus *Trigonogya* Schaeffer (new combination).



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THE PIMA COUNTY (ARIZONA) METEORITE

By E. P. HENDERSON and STUART H. PERRY

The name Pima County is provisionally given to a small but most unusual iron meteorite acquired by Stuart H. Perry in 1947 from Prof. Eldred G. Wilson, of the University of Arizona at Tucson. Its history is unknown except that it was brought to the university many years ago by someone who is supposed to have found it in the vicinity of Tucson, Pima County, Ariz.

The specimen, which has been given to the United States National Museum by Mr. Perry, weighed only 210 grams. It is pyramidal in shape, the base, which apparently was the evenest of the four sides, having been partly polished. Standing on that surface, the pyramid is about $1\frac{1}{2}$ inches high and $1\frac{3}{8}$ by $1\frac{3}{4}$ inches in the other two directions. Though the polished surface did not seem to have been sawed, but only partly rubbed down, this iron may have been part of a larger mass. If so, the larger mass is unknown, and the authors know of no other nickel-poor ataxite having the same microstructure.

The most striking feature of this iron is the remarkable flow structure developed on three of its pyramidal sides, consisting of deep furrows and ridges which cover the surface and curve around one of the edges between them. The fourth side is not furrowed and ridged but shows some minute droplets of melted metal. The fused metal in these flight markings shows minute pores formed by bubbles during the time the iron was molten.

The microstructure of the Pima County meteorite is that of a nickel-poor ataxite, consisting of kamacite with a profuse dispersion of minute particles of schreibersite. Generally grain boundaries are not

apparent, though in places there are faint remnant gamma boundaries along which phosphide particles are disposed.

At numerous points the phosphide particles are thickly crowded in round areas, which appear to the eye as dim lighter spots on the etched surface and at moderate magnification suggest galaxies in a photograph of the stars. At high magnification the phosphide particles appear irregular in shape, fairly uniform in size, and without orientation. In places these groups or "galaxies" of phosphide particles inclose small irregular black inclusions of unusual character—a dense aggregate of phosphide particles in a phosphide-poor ground-mass. At low magnification they resemble areas of black gamma-alpha aggregate, but they are definitely proved to be phosphide.

On a thin slice cut from the base of the pyramidal mass the specific gravity was determined and a chemical analysis made, after all fused material from the outer edge of the slice had been removed. The sample was placed in a flask and covered with dilute hydrochloric acid, and the gas given off was passed through a train of lead-acetate solution to precipitate any sulphide gas as lead sulphide. There was a small residue in the flask after it had stood in contact with the acid for 20 hours. This insoluble material was filtered off and washed several times with dilute hydrochloric acid to make certain that it was free from kamacite. The residue was then taken up in aqua regia, diluted to volume, and analyzed separately from the portion soluble in hydrochloric acid.

The weight of the material soluble in hydrochloric acid and called kamacite, and that of the material insoluble in hydrochloric acid and

ANALYSIS OF PIMA COUNTY METEORITE

(E. P. HENDERSON, *Analyst*)

Element	Meteorite		Schreibersite		Kamacite	
	Percent	Ratio ¹	Percent	Ratio ¹	Percent	Ratio ¹
Fe.....	93.67	1.678	54.17	0.9700	93.98	1.683
Ni.....	5.64	0.096	28.50	0.485	5.48	0.093
Co.....	0.52	0.008	2.03	0.034	0.55	0.009
P.....	0.10		15.27	0.492	None	
S.....	0.003					
Insol.....	0.05					
Sp. G.....	7.695					
Mol. ratio, $\frac{\text{Fe}}{\text{Ni}+\text{Co}}$	16.13				16.5	

¹ The molecular ratios are obtained by dividing the percentage of each element found by the atomic weight of the element.

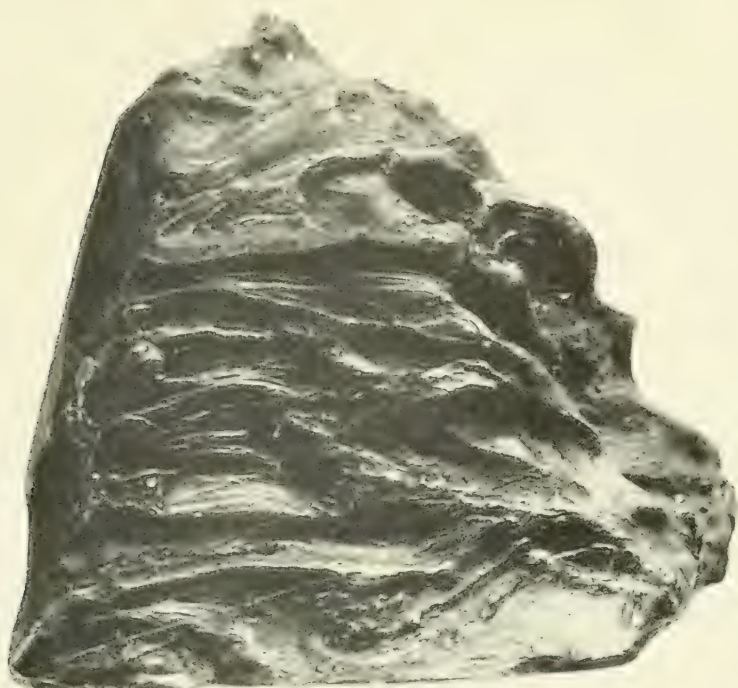


FIG. 1.—Pima County (Arizona) meteorite—a remarkable exhibition of flow structure, the result of jetting during flight. There are some globules of metal in the deeper furrows and also a few bubblelike inclusions. About twice natural size.

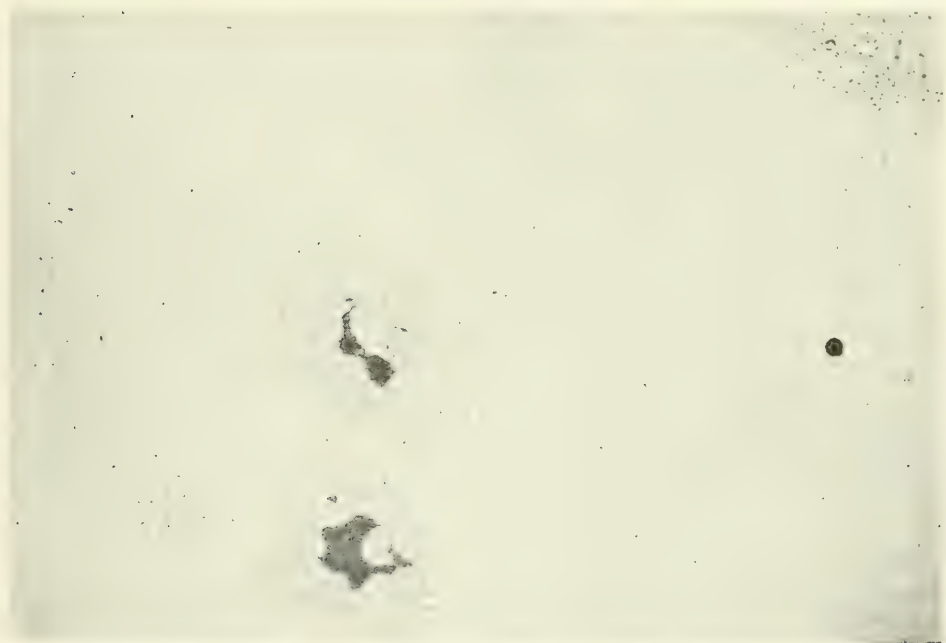


FIG. 2.—Sharply marked groups of phosphide particles, two inclosing dense areas composed of thickly crowded phosphide particles. Picral 40 seconds; \times about 35.

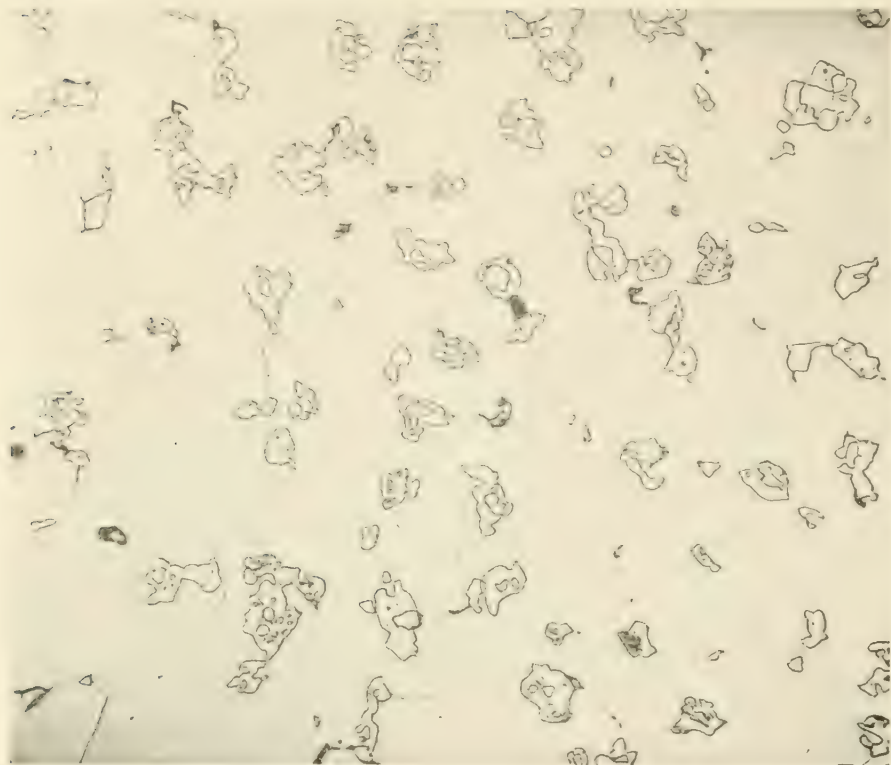


FIG. 2.—Part of the dark bodies shown in pl. 19, fig. 2, at higher magnification. The schreibersite grains are gray, embedded in a ground mass, the exact nature of which not determined. The ground mass is relatively phosphide-poor, and its white component is probably kamacite. Pictal 20 seconds; $\times 500$.

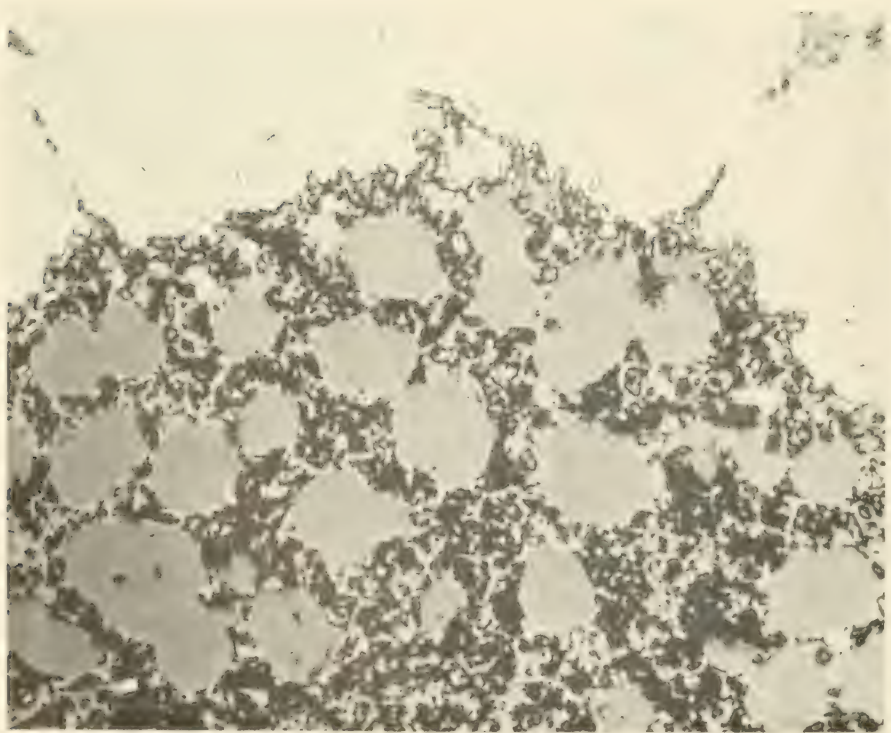


FIG. 1.—Phosphide particles, many of which contain minute inclusions of kamacite. Pictal 25 seconds; $\times 1,000$.

called schreibersite, are both unknown. The results of the determinations in both portions were used to calculate the percentage of the elements present in each portion. The analysis reported for the meteorite was obtained by combining the analyses of schreibersite and kamacite.

This schreibersite is unusually high in cobalt, considerably above any other analysis of this mineral found in the literature. Since the analysis was made by dissolving the residue, which was insoluble in hydrochloric acid, in aqua regia and dividing the solution into aliquot parts, there was no chance for any check determinations. The authors have no reason, however, to question the results. The ratio between FeNiCo and P is 3.02 to 1 and is consistent with the theoretical ratio for this mineral. The general composition of this iron is in close agreement with other nickel-poor ataxites.

The only other nickel-poor ataxite known from Arizona is the Navajo iron, which is now in the Chicago Natural History Museum. Unfortunately, that important specimen has never been studied, and the only published information as to its composition is a short note by George P. Merrill ¹ in which its type was announced and a statement made that the nickel content was 5.81 percent.

The Pima County iron, though of unknown origin, will be considered a separate and distinct meteorite unless otherwise proved from later information.

¹ Amer. Journ. Sci., ser. 5, vol. 3, p. 154, 1922.

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THE LINWOOD (NEBRASKA) METEORITE

By E. P. HENDERSON and STUART H. PERRY

THE meteorite here described was discovered in 1940 or 1941 on the farm of Joseph W. Vrana, $1\frac{3}{4}$ miles south and $1\frac{1}{4}$ miles west of Linwood, Butler County, Nebr., in section 3, township 16, range 4 (latitude $41^{\circ}26'$ N., longitude $96^{\circ}58'$ W.). It was found buried about 7 or 8 inches beneath the surface of the soil while Mr. Vrana was operating a disk harrow.

The meteorite as received by Mr. Perry weighed 46,000 grams and was presented to the United States National Museum intact except for a 1- or 2-ounce fragment removed from one end. The dimensions are approximately 12 by 11 by 5 inches. The surface is evenly covered with iron oxide, and there are no remaining structures of flight markings or original crust. It is definitely not a recent fall. There are many "thumb marks" of varying size on the surface but no unusual features worthy of special note.

The Linwood iron is a coarsest octahedrite with many silicate inclusions (pl. 21, fig. 1). The octahedral pattern is irregular and quite different from the coarse octahedrites of almost identical composition. The kamacite bands are mostly short and vary in width from 2 to 4 mm. or a little more, but in some places polyhedral masses nearly half an inch across are found. The kamacite shows abundant Neumann lines. The individual kamacite areas are not granulated as they would be if there had been reheating followed by quick cooling, yet the general structure of the octahedral pattern gives the impres-

sion of being granulated. No taenite lamellae or plessite is visible, though the microstructure shows occasional minute atypical plessite fields with a diversity of structure (pl. 21, fig. 2; pl. 22, figs. 1, 2) and occasional small schreibersite bodies. A few small thin scales believed to be taenite were found attached to the kamacite when the silicate inclusions were broken out for study. No rhabdites were observed. There are veinlets of silicates separating some of the kamacite areas, and in several cases these extend from one silicate area to another, but always around the edges of a kamacite boundary.

The most distinctive feature of this meteorite is the silicate inclusions. These are numerous, colored black with carbon, and of irregular shapes, usually elongated or sprangling, with dimensions up to 2 inches or more. The bodies of the inclusions in many places extend into the octahedral structure as black irregular veins or lines, often of considerable length, and resemble cracks invaded by iron hydroxide. Actually little hydroxide is present except around the edges of the slice close to the outer surface. Occasional particles of silicates are found in the kamacite inclosed in the silicate areas. The structure of the iron indicates that the inclusions segregated before the octahedral structure was fully established. There are, however, some small rounded or irregular-shaped masses of iron apparently isolated within the silicate areas. Although these appear, in the section cut, to be islands of iron, they may be little tongues of metal projecting into the silicate areas from the underside of the inclusion.

To provide a sample for study a slice was cut and etched, and from this slice areas of iron were selected which were free from inclusions. Likewise, portions rich in silicates were cut out to yield suitable material for a study of these inclusions.

COMPARISON OF THE LINWOOD, EL BURRO, AND MURNPEOWIE METEORITES

Element	Linwood, Nebraska (E. P. Henderson, analyst)	El Burro, Mexico (E. P. Henderson, analyst)	Murnpeowie, South Australia (M. H. Hey, analyst)
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Fe.....	93.47	93.10	93.88
Ni.....	5.98	6.02	6.32
Co.....	0.39	0.34	0.32
P.....	0.05	0.32	-----
S.....	None	None	0.006
Insol.....	0.01	0.01	0.20
Sp. G.....	7.813	7.884	-----
Mol. ratio, $\frac{\text{Fe}}{\text{Ni}+\text{Co}}$	15.63	15.57	15.00



FIG. 1.—Slice of Linwood meteorite showing the well-developed octahedral pattern and the distribution of the silicate inclusions, black because of the large quantity of carbon present. One-half natural size.



FIG. 2.—A light plessite field, the taenite lamella gray because of supersaturation with respect to kamacite. Pical 85 seconds; \times about 35.



FIG. 1.—An irregular plessite field containing lamellae of taenite (gray) and small areas of incompletely transformed gamma-alpha aggregate. Small schreibersite bodies surrounded by hydroxide. Picral 85 seconds; \times about 35.



FIG. 2.—A plessite field with a pearlitic structure of kamacite and taenite lamellae, almost surrounded by hydroxide. At this magnification it resembles similar areas of pearlitic structure in a number of other irons (e. g., Leeds, Seelasgen, Youndegin) in which the white lamellae are kamacite and the gray are taenite. Picral 30 seconds; about 40.

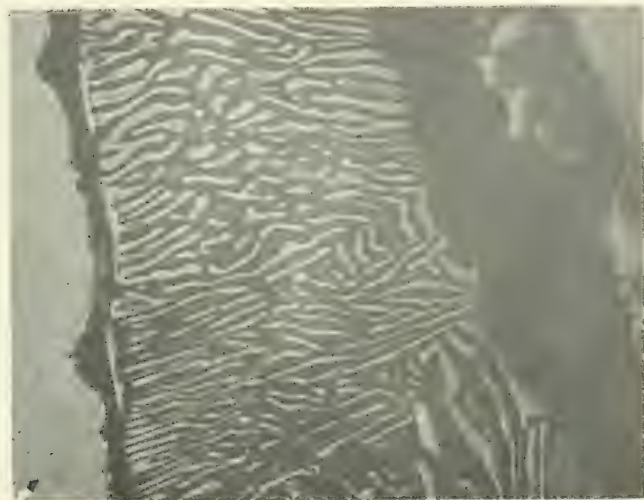


FIG. 1.—Part of area in pl. 22, fig. 2, at high magnification. The dark lamellae are shown to be not taenite but kamacite, invaded by hydroxide and wholly altered; the taenite, resistant to oxidation, surrounding hydroxide. Pical 15 seconds; $\times 300$.

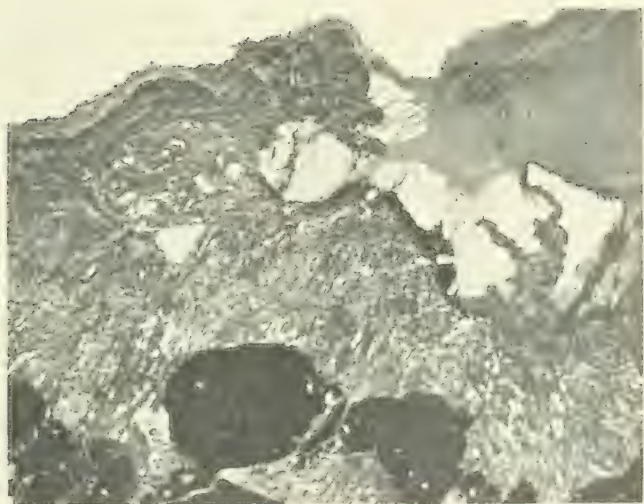


FIG. 2.—An area near the edge of a large silicate inclusion. The large black spots are silicates. Pical 30 seconds; about 45.

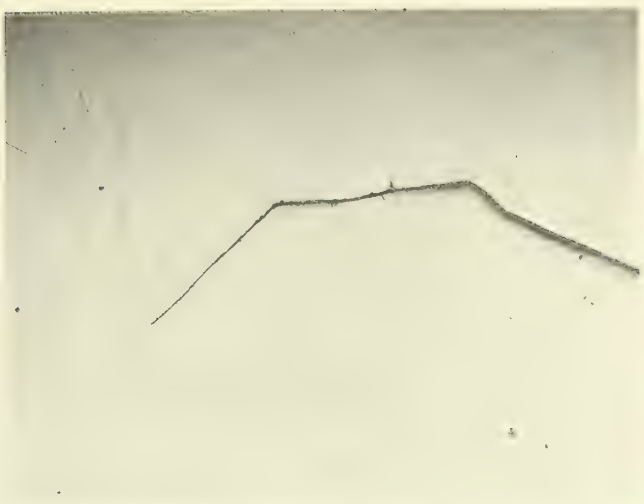


FIG. 3.—An area of kamacite showing no octahedral structure, a silicate lamella interrupting the Neumann lines. Pical 30 seconds; \times about 45.



FIG. 1.—Irregular edge of an inclusion. The silicate at one point extends in a streamer from the mass. Three small isolated particles of silicate in kamacite. Picral 30 seconds; \times about 45.

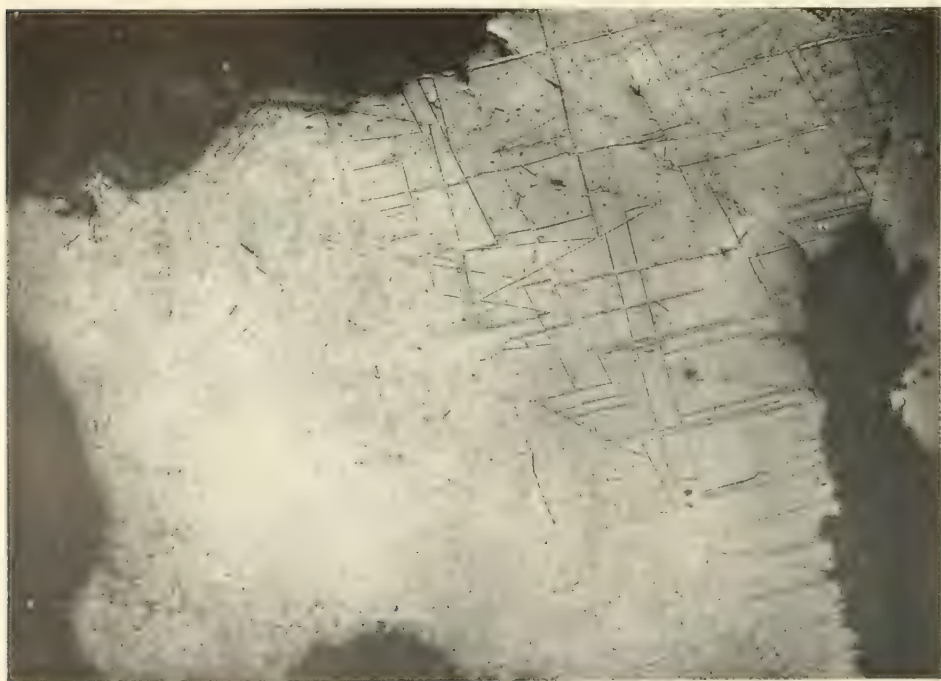


FIG. 2.—An area at the edge of the slice showing, at lower left, a zone of alteration in which the normal structure has been replaced by a secondary granulation. The dark area at lower right is probably hydroxide; that at upper left is silicate. Picral 120 seconds; \times about 30.

The composition of the metallic portion of the Linwood meteorite agrees very closely with that of the El Burro,¹ although in the latter the kamacite bands are very broad (2–3 cm.) and fairly regular in direction. The structure of the Murnpeowie² is entirely different, consisting of rounded grains, small to moderate in size, without recognizable octahedral structure.

Qualitative chemical tests were made upon the inclusions in order to determine their nature. Graphitic carbon is present in all the silicate inclusions; troilite was positively identified by collecting the hydrogen sulphide gas liberated when the powder was treated with hydrochloric acid; schreibersite was recognized by its physical habit and its strong magnetic properties. The acid extract from the silicates was found to contain magnesium, calcium, iron, nickel, traces of phosphorus, and soluble silica.

The bulk of the silicates is olivine, but there may be a small quantity of anorthite present since the quantity of calcium found in the acid soluble extract appears too large to be calcium derived from impurities in olivine. The silicates insoluble in hydrochloric acid were washed with dilute sodium-carbonate solution to remove the silica which had separated by acid attack on the olivine, and then air-dried for optical examination. Because of the complex nature of these silicates and the difficulty of obtaining enough material to make mineral separations and chemical analysis, the authors decided that an optical study would give results capable of more accurate interpretation.

The general character of the olivine was determined by assuming that all the magnesium found in the acid soluble portion was derived from olivine, combining it with the total of the acid-soluble silica and then adding enough FeO to give the theoretical olivine ratios.

COMPOSITION OF OLIVINE FROM LINWOOD, NEBRASKA, METEORITE

SiO ₂ -----	0.0468 grams-----	0.1470	1
MgO-----	0.0707 grams-----	0.1753	} 3
¹ FeO-----	0.1187 grams-----	0.1187	

¹ Calculated.

The partial analysis given above indicates an olivine with a composition midway between the magnesium and iron ends of the series very close to Fo₆₀Fa₄₀.

Optical properties of the silicates in the acid-insoluble residue of the Linwood, Nebraska, meteorite were determined by Miss Jewell J. Glass, of the U. S. Geological Survey, and Dr. Harry H. Hess, of Princeton University, to whom grateful acknowledgment is made. The following data are quoted from their reports:

“Most of the insoluble residue consists of graphite.

¹ Henderson, E. P., *Amer. Min.*, vol. 26, pp. 655–656, 1941.

² Spencer, L. J., *Min. Mag.*, vol. 24, No. 148, pp. 13–20, 1935.

"Enstatite. About two-thirds of the nonopaque insoluble material is composed of enstatite. The enstatite grains are minute; the crushed grains show distinct prismatic cleavage. Its color is gray; colorless in thin fragments. Luster vitreous. Transparent to translucent. Optically positive with a large axial angle, $2V=75^{\circ}-78^{\circ}$. Dispersion distinct, $r>v$ for most grains. The indices of refraction are: $\alpha=1.659$, $\beta=1.664$, $\gamma=1.670$. The composition of the enstatite, estimated from the optical properties, is $\text{En}_{93-94}\text{Fs}_{6-7}$.

"Chrome diopside. This green pyroxene is less abundant than the enstatite in the insoluble residue. Its grains are rounded, transparent to translucent. Optically positive; $2V$ approximately 60° . Dispersion distinct, $r>v$. Indices of refraction: $\alpha=1.689$, $\beta=1.695$, $\gamma=1.704$. Birefringence measured in bakelitic mount by comparison with quartz using Berek compensator 0.0264. Optical angle $55^{\circ}-60^{\circ}$; $\angle AC$ $39^{\circ}-40^{\circ}$.

$\alpha=1.6766$, Na light on temperature cell.

$\beta=1.6828$, calculated.

$\gamma=1.7030$, calculated from birefringence.

This pyroxene has enstatite exsolution lamellae perfectly developed parallel to (001), which indicates very slow cooling in its original environment. Estimate composition from the optical properties is $\text{Wo}_{46}\text{En}_{48}\text{Fs}_6$.

"Oligoclase. This feldspar is present in amounts equal to the pyroxene. Colorless with a good cleavage. Optically negative; $2V$ moderately large. Indices of refraction are: $\alpha=1.538$, $\beta=1.543$, $\gamma=1.546$. These properties indicate a composition close to $\text{Ab}_{80}\text{An}_{20}$.

"Maskelynite. A small amount of an isotropic material with an index of refraction of 1.539 was observed which is probably maskelynite."

COMPOSITION OF THE SILICATES IN LINWOOD, NEBRASKA, METEORITE

Olivine	-----	$\text{Fo}_{86}\text{Fa}_{14}$
Enstatite	-----	$\text{En}_{93-94}\text{FsFs}_{6-7}$
Chrome diopside	-----	$\text{Wo}_{46}\text{En}_{48}\text{Fs}_6$
Oligoclase	-----	$\text{Ab}_{80}\text{An}_{20}$

Chemically the pyroxenes are in equilibrium.

Carbon is distributed through all the inclusions but not always uniformly within each inclusion. Troilite is usually more or less concentrated around the rims of inclusions, bordering the metal. Only a few schreibersite bodies were observed in these inclusions, but they seem always to occur adjacent to the metallic iron and not as isolated masses in the graphite and silicate material.



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THE NEARCTIC SPECIES OF THE FAMILY STEPHANIDAE (HYMENOPTERA)

By HENRY TOWNES

THE Stephanidae are a family of relatively large, elongate parasitic Hymenoptera usually regarded as rare, but sometimes common in the Tropics. They have a spherical head, long neck, stalked abdomen, long hind coxa, swollen hind femur, and long ovipositor: characters that together give an appearance unlike any other insects except certain groups of Braconidae. In these features (except the ovipositor length) the primitive genus *Schlettererius* is conservative, and the more specialized genera progressively more extreme.

The family may be at once distinguished by habitus (pl. 25, figs. 1, 2) and the crown of five blunt to acute teeth surrounding the median ocellus of all species. The multisegmented antenna, the wing venation, and other structural features suggest close relation to the Braconidae. The crown of teeth on the head, shape of the mandible, venation, and some other features are reminiscent of the Orussidae.

Stephanids are often collected on dead tree trunks. Because of this and their habitus, the species are generally presumed to be parasites of wood-boring Coleoptera. Other possible hosts are aculeate Hymenoptera nesting in wood. The only known rearing record is of a short series of *Diastephanus leucostictus* in the United States National Museum, from *Agrilus kalshoveni* in Java. The adults are sluggish and awkward in walking and slow in flight.

Two genera containing six species are known from America north of Mexico. The types of the described species have been studied, except for these of the names *Stephanus bicolor* Westwood and *S. sickmanni* Schletterer. Most of the specimens studied are in the

United States National Museum at Washington, D. C. The locations of specimens in institutional collections are indicated (in parentheses) by the name of the city in which they are stored or, in private collections, by the name of the owner.

KEY TO THE NEARCTIC GENERA OF STEPHANIDAE

First abdominal tergite about 2.5 as long as wide, not fused with its sternite; hind wing with nervellus; hind femur with three larger teeth beneath; hind tarsus of female with five segments; eighth tergite of female with a median apical point. (See pl. 25, fig. 1)-----*Schlettererius*
 First abdominal tergite at least 4.0 as long as wide, fused with its sternite; hind wing without nervellus; hind femur with two larger teeth beneath (apical tooth often subdivided); hind tarsus of female with three segments; eighth tergite of female (of Nearctic species) without a median apical point. (See pl. 25, fig. 2)-----*Megischus*

Genus *SCHLETTERERIUS* Ashmead

PLATE 25, FIGURE 1

Schlettererius ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 20, 1900. Type: *Stephanus cinctipes* Cresson. Monobasic.

The free first abdominal sternite and exceptionally complete venation mark this genus as the most primitive of the family. The 5-segmented hind tarsus of the female, three teeth on the under side of the hind femur, and several venational features indicate rather close relation to *Stephanus*, a monotypic genus of Europe.

Schlettererius contains only the species below. *Stephanus rufipes* Say has been referred to *Schlettererius*, but it belongs in the Braconidae, as evidenced by the following characters in Say's description: Abdomen sessile, the petiole not visible; thorax not remarkably attenuate before; propodeum with two slightly elevated, longitudinal, distant lines; stigma large, triangular, and fuscous; length 5 mm. Say placed the species in *Stephanus* largely on similarity of wing venation with Jurine's figure of *Stephanus serrator*. It has never been correctly identified since it was first described.

SCHLETTERERIUS CINCTIPES (Cresson)

PLATE 25, FIGURE 1

Stephanus cinctipes CRESSON, Trans. Amer. Ent. Soc., vol. 8, proc. xviii, 1880. Type: ♀, Washington Territory (Philadelphia).

Forewing of male 8-13 mm. long, of female 8-16 mm. long; ovipositor sheath about 2.0 as long as the body. Easily distinguished by the characters pointed out in the key to genera. See plate 25, figure 1 for an illustration.

Black. Second and third abdominal segments, first abdominal segment except more or less of its base, and sometimes the fourth abdominal segment of male basally, ferruginous; labrum, ventrolateral triangles on frons of male, basal 0.15 to 0.3 of tibiae, apices of front and middle femora, and a very broad subapical band on ovipositor sheath white; tegula brown; extreme base of wing white; forewing light brown beyond the basal vein, with a narrow hyaline band diagonally across the discal cell and across the base of the second discoidal cell; apical 0.5 of hind wing light brown; tarsi whitish to light brown, darkest apically.

Specimens.—9 ♂, 21 ♀, from ARIZONA (Cochise County); BRITISH COLUMBIA (Pender Harbor, Robson, and Vancouver); CALIFORNIA (Alta, Bass Lake, Cisco, Fallen Leaf Lake in El Dorado County, McCloud, Meyers, Pinecrest, Porterville, Riverton in El Dorado County, and Yreka); IDAHO (Coeur d'Alene); OREGON (at 6,500 feet on Antelope Mountain in Harney County, and Ashland); and WASHINGTON (Ashford, Mount Rainier, and Kooskooskie in Walla Walla County). Dates of collection run from June 1 to August 29.

This species has about the same range as *Pseudotsuga taxifolia* (Douglas fir) and seems to be most common in forests of this tree.

Genus MEGISCHUS Brullé

PLATE 25, FIGURE 2

Megischus BRULLÉ, Histoire naturelle des insectes, Hyménoptères, vol. 4, p. 537, 1846. Type: (*Megischus annulator* Brullé) = *furcatus* Lepeletier and Serville. Designated by Viereck, 1914.

Bothriocerus SICHEL, Ann. Soc. Ent. France, ser. 3, vol. 8, p. 759, 1860. Type: *Bothriocerus europoeus* Sichel. Designated by Viereck, 1914.

Hemistephanus ENDERLEIN, Stettin. Ent. Zeit., vol. 67, p. 301, 1906. Type: *Stephanus macrurus* Schletterer. Original designation.

Megischus is a pantropic genus containing about 60 described species, but at least 20 of these appear to be synonyms. Most of the species now stand in literature under the generic name *Stephanus*. *Megischus* differs most conspicuously from *Stephanus* and *Schlettererius* in having only three segments in the female hind tarsus, and from all other genera in the family in its more complete venation.

Five Nearctic species are included, divisible into three species groups as indicated in the key to species.

KEY TO THE NEARCTIC SPECIES OF MEGISCHUS

1. First tergite mat, smooth; pronotum mat (*texanus* group)----- 2
- First tergite polished and with conspicuous transverse wrinkles (pl. 25, fig. 2);
pronotum polished----- 3

2. Posterior half of pronotum mat and with fine transverse striation (pl. 25, fig. 3); mesopleurum mat and rugulose; brachial vein distinct; body dark brown----- 1. *californicus*, new species
Posterior half of pronotum mat, not striate (pl. 25, fig. 4); mesopleurum mat and with large shallow punctures; brachial vein subobsolete; body light brown----- 2. *texasus* Cresson
3. Outer face of hind femur mat; pronotum, as seen from above, with a deep subapical notch on each side, and with a weak subbasal swelling (pl. 25, fig. 5); inner edge of hind femur of female with a weak submedian indentation (*bicolor* group)----- 4
Outer face of hind femur polished; pronotum, as seen from above, without a deep subapical notch on each side, and with a strong subbasal swelling (pl. 25, figs. 6, 7); inner edge of hind tibia of female with a strong, almost semicircular indentation (*brunneus* group)----- 5
4. Head and pronotum blackish----- 3a. *bicolor sickmanni* (Schletterer)
Head and pronotum ferruginous----- 3b. *bicolor bicolor* (Westwood)
5. Ovipositor sheath with a subapical white band; pronotum sculptured as in pl. 25, fig. 6, with a subapical pair of short ridges on each side; lower half of temple with scattered weak or obsolescent punctures.
4. *arizonicus*, new species
Ovipositor sheath without a white subapical band; pronotum sculptured as in pl. 25, fig. 7, with a subapical set of about four sharp cross ridges; temple with coarse punctures next to the eye, or these punctures weak or absent.
5. *brunneus* Cresson

1. *MEGISCHUS CALIFORNICUS*, new species

PLATE 25, FIGURE 3

Mesopleurum rugulose.

Forewing of males about 5 mm. long, of females 5.5–6.5 mm. long; temple rugulose in its lower $0.6 \pm$ and in its upper $0.15 \pm$, the rest polished; pronotum mat, the front 0.3 with cross ridges, the rest with fine cross striae (pl. 25, fig. 3), which are often obsolescent in smaller specimens; mesopleurum and propodeum rugulose; brachial and subdiscoidal veins weak but distinct; outer face of hind femur mat, apically somewhat rugulose; hind tibia of female pinched laterally at its basal 0.35, most strongly indented on its outer side, beyond the pinch swollen to the width of the hind femur, its inner edge without a noticeable median indentation; hind basitarsus of female narrow, not expanded apically; first tergite mat and somewhat rugulose, in the female about 5.5 as long as wide; ovipositor sheath about 1.15 as long as the body.

Dark brown to blackish, with the antenna and legs a little paler. Cheek mostly pale brown; wings lightly infusate; ovipositor sheath with a subapical white band.

Type.—♀, U.S.N.M. No. 58647, Los Angeles County, Calif., D. W. Coquillett (Washington).

Paratypes.—CALIFORNIA: ♀, Carville, Trinity County, 2,400–2,500 feet, June 3, 1934 (Townes). ♀, Greenhorn Mountains, Tulare

County, May 7, 1931, E. C. Van Dyke (San Francisco). ♂, Mount Diablo, Contra Costa County, June 25, 1939, E. C. Van Dyke (San Francisco). ♂, Mount Wilson, 5,000 feet, May 26, 1918, J. O. Martin (San Francisco). ♂, Piñon Flat, Santa Rosa Mountains, May 27, 1941, D. J. and J. N. Knull (Washington). 11 ♂, Santa Rosa Mountains, May 27 to July 4, 1946, D. J. and J. N. Knull (Columbus and Townes). ♀, Switzer's Camp, San Gabriel Mountains, June 1927 (Cambridge).

2. MEGISCHUS TEXANUS Cresson

PLATE 25, FIGURE 4

Megischus texanus CRESSON, Trans. Amer. Ent. Soc., vol. 4, p. 190, 1872. Type: ♀, Comal County, Tex. (Philadelphia).

Mesopleurum mat and sparsely punctate; body light brown.

Forewing of males 4–5 mm. long, of females 5–8 mm. long; temple with a few weak punctures, weakly mat in its lower $0.6 \pm$ and in its upper $0.15 \pm$, the rest polished; pronotum mat, its anterior 0.3 to 0.4 with cross ridges (pl. 25, fig. 4); mesopleurum mat, with sparse large shallow punctures; propodeum mat, its central part, especially apically, more or less punctate to punctato-rugose; brachial and subdiscoidal veins subobsolete; outer face of hind femur with a few shallow punctures, mat, most strongly mat toward its apex; hind tibia of female pinched laterally at its basal 0.35, most strongly indented on the outer side, beyond the pinch swollen to the width of the femur, its inner edge without a noticeable median indentation; hind basitarsus of female narrow, not expanded apically; first tergite mat, smooth, in the female about 7.0 as long as wide; ovipositor sheath about 0.9 as long as the body.

Light brown. Wings tinged with brown; tergites 2–5 with a more or less distinct darker brown apical band, and the apical part of the abdomen often darker brown than the rest of the body; ovipositor sheath with a subapical white band.

Specimens.—ARIZONA: ♀, Chiricahua Mountains, June 3, 1935, J. N. Knull (Washington). ♀, Douglas, April 13, 1939, W. W. Jones (Washington). ♂, Huachuca Mountains, June 11, 1933, R. H. Beamer (Lawrence). ♂, Huachuca Mountains (Washington). ♀, Prescott, May 19, Barber and Schwarz (Washington). ♂, Tucson, July 20, 1940, D. J. and J. N. Knull (Washington). ♀, Sunnyside Canyon, Huachuca Mountains, July 9, 1940, R. H. Beamer (Lawrence). ♀, southern Arizona (Cambridge).

CALIFORNIA: ♂, 2 ♀, Santa Rosa Mountains, July 4, 1946, D. J. and J. N. Knull (Columbus and Townes).

MEXICO: ♀, Nogales, Sonora, June 25, 1942 (Washington).

OKLAHOMA: ♂, Wichita National Forest, June 26, 1936, R. H. Beamer (Lawrence).

TEXAS: ♂, Brownwood, August 23, 1921, R. H. Painter (New York).
♂, Chisos Mountains, July 17, 1946, D. J. and J. N. Knull (Columbus).
♀, College Station, September 30, 1936 (Townes). ♀, Davis Mountains, July 2, 1940, D. J. and J. N. Knull (Washington). 2♂, 1♀, Eastland County, April 4, May 9, and June 10, 1941, Grace O. Wiley (Columbus). ♀, Gillespie County, May 2, 1935, J. N. Knull (Washington). ♂, ♀, Gillespie County, May 7, 1946, D. J. and J. N. Knull (Columbus). ♀, New Braunfels, June 2, 1901 (Cambridge). ♂, Nueces River, July 2, 1917 (Ithaca). ♀, Star County, July 5, 1938, R. H. Beamer (Townes). ♀, Uvalde, June 21 (Washington). ♀, Texas (Washington).

3. *MEGISCHUS BICOLOR* (Westwood), new combination

PLATE 25, FIGURES 2, 5

Pronotum, as seen from above, with a deep subapical notch in each side (pl. 25, fig. 5).

Forewing of males 4.5–8.5 mm. long, of females 6.5–11 mm. long; temple polished, with a few fine punctures; pronotum polished, weakly swollen subbasally, medially and subbasally with irregular coarse cross ridges and subbasally with some large indistinct punctures; pronotum subapically with a large dorsal quadrate impression that connects on each side with a very deep notch (pl. 25, fig. 5); mesopleurum polished, with large round punctures separated by about 0.4 their diameter; brachial and subdiscoidal veins usually distinct, sometimes obsolescent in small specimens; outer face of hind femur mat. subpolished basally; hind tibia of female pinched sharply at its basal 0.4, beyond which it is swollen to 0.8 the width of the hind femur, its inner face somewhat indented at the apical 0.4; hind basitarsus of female rather narrow, weakly expanded apically; first tergite polished, with close interrupted cross ridges, in the female about 9.0 as long as wide; ovipositor sheath about 1.12 as long as the body.

Blackish brown, or sometimes more or less dark ferruginous, the ferruginous most often restricted to the head and fore part of the thorax but sometimes covering the entire body. Cheek mostly stramineous; antenna, hind margin of pronotum, tegula, front and middle legs, hind trochanters, and basal 0.33 of hind tibia usually paler than the ground color, often brownish ferruginous; wings subhyaline; ovipositor sheath with a white preapical band.

This species occurs in mesic woods from Ontario to Florida, west to Iowa, Texas, Arizona, Utah, and southern California. On the basis of color it is divisible into two subspecies, the typical subspecies occupying the Lower Austral and Tropical Zones of the Southeastern States, and the other subspecies the rest of its range.

3a. *MEGISCHUS BICOLOR SICKMANNI* (Schletterer), new combination

Stephanus sickmanni SCHLETTERER, Berlin. Ent. Zeitschr., vol. 33, p. 152, 1889.

Type: ♀, Georgia (Berlin).

Megischus canadensis DAVIS, Trans. Amer. Ent. Soc., vol. 24, p. 349, 1898. Type:

♀, Toronto, Ontario (Philadelphia). New synonymy.

Head and pronotum brown to blackish.

Specimens.—15 ♂, 26 ♀, from ARIZONA (Chiricahua Mountains and Sabino Canyon); CALIFORNIA (Santa Rosa Mountains); CONNECTICUT (Cornwall); DELAWARE (New Castle County); DISTRICT OF COLUMBIA (Washington); IOWA; KANSAS (Leavenworth County); MARYLAND (Plummers Island and Takoma Park); MASSACHUSETTS (Framingham and Holliston); MICHIGAN (Deerfield Township and Midland County); MISSOURI (Kansas City); NEW JERSEY (Cresskill); NEW YORK (Auburn, Bronxville, Farmingdale, Ithaca, and Wading River on Long Island); NORTH CAROLINA (Hertford County); OHIO (Delaware County and Puritas Spring); PENNSYLVANIA (Glenside and Hummelstown); TEXAS (Austin, Brownsville, Cisco, Dallas, and Sabinal); UTAH (Emery County); VIRGINIA (Cape Henry, Falls Church, and Nelson County); and WEST VIRGINIA (West Sulphur). The specimen reported above from Kansas City, Mo., was reported and described by Viereck (Trans. Kansas Acad. Sci., vol. 19, p. 325, 1905) as *Stephanus acutus* of Lepeletier and Serville. The true "*Stephanus*" *acutus* is a Neotropical species.

Adults are on the wing through the summer and are most commonly taken in July and August. Some early and late dates of collection are April 25 at Dallas, Tex., June 6 at Plummers Island, Md., and September 10 at Cape Henry, Va. An adult was reared from *Quercus bicolor* at Hummelstown, Pa., by J. N. Knull, and one taken on dead *Populus grandidentata* at Ithaca, N. Y., by W. W. Middlekauff. I took a short series on a standing dead beech (*Fagus grandifolia*) at Takoma Park, Md. The tree had been dead about 4 years, and the bark was beginning to fall off but most of it still adhered tightly. On the bark of the trunk the stephanid looked much like a *Xorides* (Ichneumonidae), but one male and one female were seen with the head and fore part of the thorax raised high from the trunk and the hind legs spread wide apart. In the case of the female the hind legs were closely applied to the bark. The male in this position was cleaning its antennae. When a net was put near a specimen on the trunk, it would walk away backward and would be slow to take flight. Flight, walking, and other movements were all sluggish.

3b. *MEGISCHUS BICOLOR BICOLOR* (Westwood), new combination

Stephanus bicolor WESTWOOD, Ann. Nat. Hist., vol. 7, p. 538, 1841. Type: ♀, Georgia (Linnaean Soc., London).

Stephanus bicolor WESTWOOD, Trans. Ent. Soc. London, ser. 1, vol. 3, p. 276, 1843.

Further description.

Megischus floridanus DAVIS, Trans. Amer. Ent. Soc., vol. 24, p. 349, 1898. Type: ♀, Florida (Philadelphia). New synonymy.

Head and pronotum, and often more of the body ferruginous.

Specimens.—FLORIDA: ♀, Biscayne Bay, A. T. Slosson (New York). ♀, Elliotts Key (Washington). ♂, Enterprise (Washington). ♀, Fort George, June 1883 (Washington). 3 ♀, Hilliard, August 19, 1930, J. Nottingham and R. H. Beamer (Lawrence and Townes). ♀, Key West, November 1945, H. L. Black (Washington). ♀, Long Pine Key, March, Clench and Schevill (Cambridge). ♀, Miami, August 27, 1933, Frank N. Young (Gainesville). ♀, Miami Beach, April 18, 1918, T. E. Snyder (Washington). ♂, Paradise Key, February 27, 1919, E. A. Schwarz (Washington). ♀, Plymouth, February 20, 1918, G. G. Ainslie (Washington). ♀, Florida (Washington).

LOUISIANA: ♀, Ruston, October 10, 1908, H. S. Smith (Washington).

SOUTH CAROLINA: ♀, Charleston, May 24, 1934, J. C. Watts (Townes).

NO DATA: ♀ (Washington).

4. *MEGISCHUS ARIZONICUS*, new species

PLATE 25, FIGURE 6

Pronotum polished, strongly swollen subbasally, anteriorly with a pair of high sharp carinae on each side (pl. 25, fig. 6).

Type female: Forewing 12.5 mm. long; temple polished, its lower 0.5 with sparse large shallow punctures; pronotum polished, with a strong subbasal swelling that bears a few punctures, medially very coarsely rugose, and apically with a strongly impressed area bordered on each side by two sharp oblique ridges (pl. 25, fig. 6); mesopleurum polished, with scattered large deep punctures separated by 1.0 or more their diameter; propodeum polished, coarsely rugoso-punctate; brachial and subdiscoidal veins distinct; outer face of hind femur polished, with a few shallow punctures; hind tibia sharply pinched near the middle, just beyond which on each side is a blunt transverse ridge and on the inner face an almost semicircular dip; apical half of hind tibia swollen to about 0.7 the width of the hind femur; hind basitarsus 4.7 as long as wide, a little expanded apically; first tergite 4.5 as long as wide, polished, and with rather close cross ridges; ovipositor sheath 1.1 as long as the body.

Piceous. Cheek mostly stramineous; top half of head tinged with ferruginous; hind margin and hind corner of pronotum, tegula, knees, trochanters, tarsi (the front tarsi missing), and propodeum except

laterally, dark ferruginous; wing weakly infumate, the forewing marked with brown along the veins near the outer end of the brachial cell; abdomen ferruginous basally, shading to dark ferruginous apically; ovipositor sheath with a preapical white band.

Paratype male: Similar to the type female but smaller (forewing 6.5 mm. long) and with weaker sculpture and the punctures less regularly formed. The punctures on the lower 0.5 of the temple are almost obsolete, and the pair of high sharp carinae on each side of the front end of the pronotum are almost transverse rather than strongly oblique. The first tergite is 10 times as long as wide and almost smooth.

Type.—♀, U.S.N.M. No. 58648, on white oak, Bear Canyon, Catalina Mountains, Ariz., M. Chrisman (Washington).

Paratype.—♂, San Domingo, Baja California, July 19, 1938, Michelbacher and Ross (San Francisco).

5. MEGISCHUS BRUNNEUS Cresson

PLATE 25, FIGURE 7

Megischus brunneus CRESSON, Proc. Ent. Soc. Philadelphia, vol. 4, p. 84, 1865,
Type: ♀, Cuba (Philadelphia).

Pronotum polished, anteriorly with about four sharp high cross carinae (pl. 25, fig. 7); ovipositor sheath without a subapical white band.

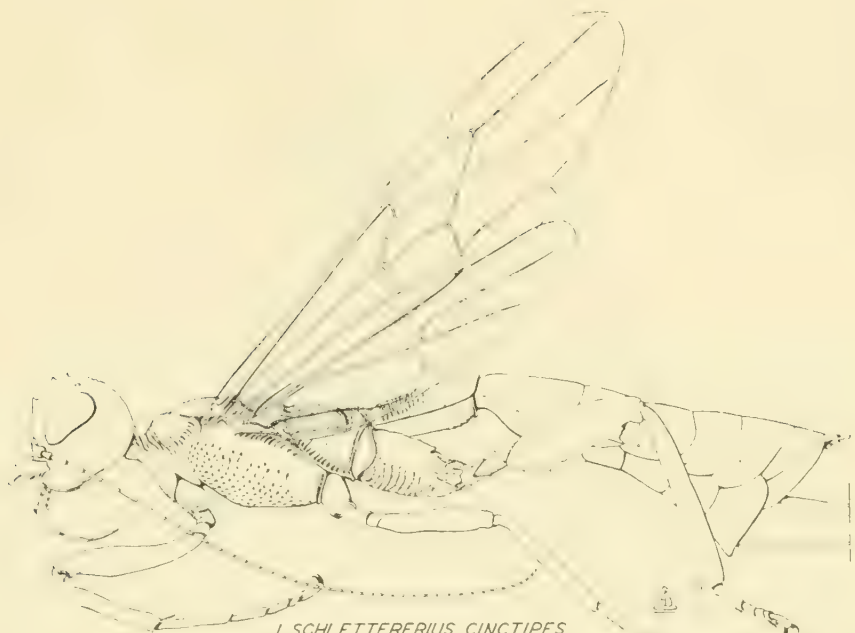
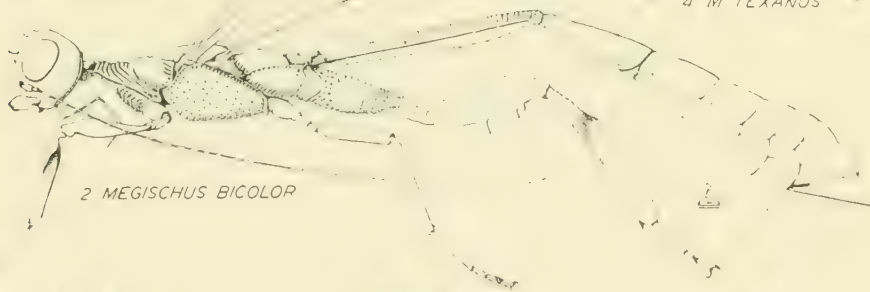
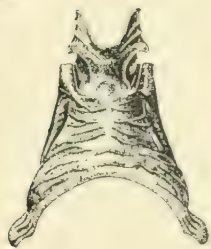
Forewing of male 8 mm. long, of female 9–16 mm. long; temple polished, in larger specimens with large irregular punctures behind the eye; pronotum polished, subbasally with a strong swelling that bears coarse irregular punctures, medially with a raised transverse area that is coarsely rugoso-punctate, and apically with about four high sharp transverse carinae, some of which are usually interrupted medially (pl. 25, fig. 7); mesopleurum polished, with large round punctures separated by about 0.7 their diameter; propodeum polished, with rather close large round punctures; brachial and subdiscoidal veins distinct; outer face of hind femur polished, with a very few fine shallow punctures; hind tibia of female sharply pinched at its basal 0.35, just beyond this with a sharp rounded dip in its anterior face; apical half of female hind tibia swollen to the width of the hind femur; hind basitarsus of female about 3.0 as long as wide, strongly expanded apically; first tergite polished, with rather coarse cross ridges, in the female about 6.0 as long as wide; ovipositor sheath about 1.1 as long as the body.

Piceous. Cheek mostly stramineous; hind margin and hind corner of pronotum, tegula, sometimes the propodeum, front and middle legs, trochanters, basal part of hind tibia, hind tarsus, and basal part of

first tergite usually more or less stained with ferruginous; wings weakly infumate, the forewing marked with brown along the veins near the outer end of the brachial cell; ovipositor sheath uniformly blackish.

Specimens.—CUBA: ♂, 2 ♀, taken on trees, Central Jaronú, November 10, 1930, L. C. Scaramuzza (Washington). ♀, Taco Taco, April 1-6, 1922, S. C. Bruner, J. Acuña, and C. H. Ballou (Washington).

FLORIDA: ♀, on buttonwood, Cape Sable, February 28, 1940, C. F. Rainwater (Washington). ♀, Miami, August 1, 1938 (St. Paul).

1. *SCHLETTERERIUS CINCTIPES*3 *M. CALIFORNICUS*4 *M. TEXANUS*2 *MEGISCHUS BICOLOR*5 *M. BICOLOR*6 *M. ARIZONICUS*7 *M. BRUNNEUS*

1, *Schlettererius cinctipes* (Cresson); 2, 5, *Megischus bicolor* (Westwood); 3, *M. californicus*, new species; 4, *M. texanus* Cresson; 6, *M. arizonicus*, new species; 7, *M. brunneus* Cresson.



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NINE NEW XYSTODESMID MILLIPEDS FROM VIRGINIA
AND WEST VIRGINIA, WITH RECORDS OF ESTAB-
LISHED SPECIES

By RICHARD L. HOFFMAN

THE millipeds reported herein were accumulated largely through field work by the author and by Dr. Horton H. Hobbs, Jr., during the summer of 1947. Five of the species listed were collected near the author's home, in Alleghany County, Va., and four species are due to Dr. Hobbs' field work at Mountain Lake, Va., and in southern West Virginia. The others, with a few exceptions, were obtained on a trip through southwestern Virginia in June and July by Hubert I. Kleinpeter and the author. Lloyd G. Carr sent a number of specimens from Augusta County, and Charles M. Wilson and Miss Margaret Walton have contributed a large amount of material from Mountain Lake. Individual specimens have been donated by Dr. L. R. Cleveland, Lewis Wright, and Miss Mary Timberlake.

Of the 16 species here listed, 9 are described as new. In addition, records of the occurrence of established species are given, wherever the collections were able to provide new distributional stations. In connection with previously described forms, it seemed pertinent to add a citation to the original description as well as to mention the type locality. A brief diagnosis is supplied for each genus—in some cases quoted from the original generic description.

In previous descriptions of xystodesmids there has been no uniformity about the aspects from which the male gonopods have been drawn. I believe that comparisons of species would be facilitated greatly if

the figures were made with some deference to uniformity of position. The drawings that accompany the following descriptions were made to show the configuration of the left gonopod and were made from direct cephalic and lateral or mesial aspects after the appendage had been removed and oriented properly.

I take pleasure in acknowledging my indebtedness to H. F. Loomis for examining specimens and supplying information, to Lawrence M. Carter for assistance with the drawings, and to Dr. Hobbs for many courtesies attendant upon the work as well as for many collections.

Family XYSTODESMIDAE Cook

Xystodesmidae COOK, Ann. New York Acad. Sci., vol. 11, p. 5, 1895. (Type genus: *Xystodesmus* Cook.)

Genus APHELORIA Chamberlin

Aphcloria CHAMBERLIN, Can. Ent., vol. 53, p. 232, 1921. (Genotype: *Fontaria montana* Bollman.)

Telopodite of male gonopod a simple coiled blade, with a small curved basal spine.

APHELORIA ADELA Chamberlin

Aphcloria adela CHAMBERLIN, Bull. Univ. Utah, vol. 30, No. 2, p. 10, fig. 34, 1939 (Ithaca, N. Y.).

VIRGINIA: *Grayson County*: Mount Rogers, east side near top, 1 male, RLH No. 7-147-2b; *Tazewell County*: Burkes Garden, 1 male, RLH No. 6-3047-1b.

These records constitute a very considerable extension in the known range of *adela*, which heretofore has been reported only from Ithaca, N. Y. Doubtless it ranges southward in the Appalachians and will be found in West Virginia, Maryland, and Pennsylvania.

It is not impossible that future studies may show *adela* to be a synonym of *A. coriacca*, but for the time being it seems possible to distinguish the former on minor differences in the gonopods and pattern.

APHELORIA ANTROSTOMICOLA, new species

PLATE 26, FIGURES 1, 2

Diagnosis.—Telopodite of male gonopod strongly recurved, forming slightly more than a complete circle, bent mesiad with distal end directed cephalically; color black, with yellow keels and large crescent-shaped orange spots on the posterior margins of the tergites.

Description.—A medium-sized species. Length of holotype, 38, width, 8.8 mm.; length of allotype, 40, width, 8.5 mm. Width of body averages 22 percent of length. Segments between fourth and

fifteenth of full width. Keels broad, continuing slope of dorsum, usually slightly separated. Anterior corners of keels rounded; posterior corners through twelfth segment forming right angles, thereafter becoming increasingly produced caudally. Most keels with anterior corners lobed cephalad. Dorsolateral edges of keels produced into ridges, most conspicuously so on posterior segments; repugnatorial pores dorsal in position, near middle of keel.

Collum with posterior margin relatively straight in both sexes.

Anal segment truncate distally and bearing a small terminal tuft of setae, triangular in dorsal aspect, slightly longer than broad, its base wider than the distance between keels of penultimate segment. Anal valves slightly inflated, glabrous, their mesial edges produced into ridges, a tiny tubercle on each valve near the center of the mesial margin, no other sculpturing. Preanal scale triangular, as broad as long, somewhat rounded distally, with three terminal lobes of which the median lobe is conspicuously larger than the other two, in this respect differing from most other species.

Bases of the last pair of legs almost in contact mesially. Sternites and coxae unarmed, femora with long spines; legs hirsute, terminating in heavy curved claws. Coxae of the second pair of legs of the male with the usual rounded knobs, which are truncate and flat distally.

Gonopods typical of the genus in consisting of a somewhat enlarged basal portion and a rounded, loosely coiled telopodite blade, which in this species makes somewhat more than a complete circle and is bent mesiad and then distad, as shown in the drawings. Basal spine rather small and slightly curved, arising from a cephalolateral shoulder. Mesial side of base with a rounded setiferous shoulder.

In life, dorsum black with caudolateral two-thirds of keels bright yellow. A central row of large crescentic reddish-orange blotches on posterior margins of the tergites; in males these blotches are usually separated from the yellow keels but in females tend to be in contact—in which case the demarcation between the colors is a sharp one. Head light brown, margins of labrum and antennae light brown, sides of head and antennal sockets yellowish. Each article of antennae white distally. Sides of body a burnished yellow, legs light yellow, sternites tan. Anal valves yellowish, usually with a central brown mark.

Type specimens.—Holotype and female allotype in the U. S. National Museum, No. 1802. Additional male and female topoparatypes in my personal collection, No. 6-1647-1b.

Type locality.—Sinkhole at entrance to Stull's Cave, on property of C. R. Stull, 8 miles southwest of Lowmoor, Alleghany County, Va., on County Route 608. Seven specimens were collected during

the course of about 10 minutes in the leaf mold accumulated in the bottom and on the sides. No specimens were found in the adjacent woods.

Remarks.—As far as color pattern goes, this species is like *A. virginia* Chamberlin from Pittsylvania County, Va., and the new species described in this paper as *A. picta* from Mountain Lake, Va. However, according to the description, *virginia* has the keels orange and the median spots yellow, a reversal of the pattern in the other two species. The median spots of *antrostomicola* tend to merge into the yellow of the keels, whereas in none of my specimens of *picta* does this condition obtain. Besides, the gonopod of *antrostomicola*, although similar to that of *picta*, presents several differences.

The specific name of this species refers to the habitat in which the types and only known specimens were collected.

APHELORIA ASPILA Chamberlin

Apheloria aspila CHAMBERLIN, Bull. Univ. Utah, vol. 30, No. 2, p. 10, fig. 33, 1939 (Soco Falls, N. C.).

VIRGINIA: *Grayson County*: Mount Rogers, east side near top, RLH No. 6-3047-2b (one male).

Previously known only from the type locality, which is near Waynesville, Haywood County, N. C. This new record extends the range northward in the southern Blue Ridge to the Balsam Mountains. *A. aspila*, like *Boraria carolina*, which is also known only from Soco Gap and Mount Rogers, may be found to be widespread in western North Carolina.

APHELORIA CORIACEA (Koch)

Fontaria coriacea KOCH, System der Myriapoden, p. 141, 1847 ("Pennsylvania").

VIRGINIA: *Albemarle County*: Stony Point, RLH No. 10-3047-1e (1 male); *Alleghany County*: 2 miles northwest of Clifton Forge, RLH No. 6-1447-1a (3 males, 4 females); *Augusta County*: Sherando Lake, near Lyndhurst, RLH No. 8-1547-1b (many males and females collected by Carr); *Roanoke County*: Roanoke, RLH No. 7-547-1 (1 male collected by Wright).

The occurrence of this form at Clifton Forge is interesting. It is common at and around a large, deserted sawmill, but only once in many years' acquaintance with the region have I seen a specimen in a different place. This exceptional creature was across a small ridge from the sawmill and no more than a thousand yards away from it.

At Roanoke, where I have seen fragments of this form, it seemed to be common, of all places, in pine woods on a dry shale monadnock. Bleached specimens could be found under rocks and logs, and Mr. Wright (who later secured a living specimen nearby) informed me

that in wet weather he had seen the millipeds crawling about in the pine stands.

The locality at which Mr. Carr obtained a large series of specimens is at the base of the Blue Ridge, in a moist hardwood forest with many ponds and marshes.

All the specimens listed above are very large, some attaining a length of 45 mm. The keels are bright reddish pink, and the posterior margins of the keel are marked by broad yellow bands. Mr. Loomis, upon examination of a specimen, suggested that Koch's name be used for my material, an allocation with which I gladly concur. The male gonopods of the specimens are identical with those of many large, cross-banded *Aphelorias* from Ohio, West Virginia, and Pennsylvania. The status of the banded *Aphelorias* is confused, and some hesitation attends my identification of some of the Virginia material. A thorough revision of the genus, based on adequate series of specimens, is much to be desired.

APHELORIA KLEINPETERI, new species

PLATE 26, FIGURES 3, 4

Diagnosis.—A medium-sized species characterized by the color pattern of black dorsum and red keels and by the structure of the male gonopods, the telopodite of which is expanded distally into a spatulate portion suggesting that of *Sigiria*.

Description.—Length of holotype, 37, width, 7.2 mm., length of allotype, 39.1, width, 8.1 mm. Width of body averages 20 percent of length. Segments between fourth and fifteenth of full width. Keels moderately broad, not overlapping. Anterior corners lobed, rounded; posterior corners through twelfth segment approximately right-angled, becoming caudally produced on the posterior third of body. Keels of segment 18 almost enclosing those of 19. All keels with dorso-lateral edges raised, particularly so on last 10 segments; repugnatorial pores on dorsal side of swellings.

Collum crescentic in shape, as long as the next two segments combined, its posterior edge with a median emargination, ventrolateral extremities directed slightly caudoventrad.

Anal segment triangular in dorsal aspect, longer than broad, base slightly wider than distance between keels of penultimate segment; end truncate, bearing a few setae. Anal valves slightly inflated, glabrous, their mesial edges produced into ridges each of which bears a single setiferous papilla. Each valve with a small knob near the center, otherwise unsculptured. Preanal scale very broadly triangular, rounded, with one terminal and two smaller lateral lobes.

Bases of last pair of legs almost in contact mesially. No coxal or sternal armature. Trochanter and femur with large spines. Femora

practically glabrous, trochanters and terminal podomeres very hirsute. Terminal claw curved, strong. Male with coxae of second pair of legs bearing the usual knobs, these rounded distally.

Gonopod with the loosely coiled blade and basal spine characteristic of *Apheloria*; distinct in the large subterminal expansion of telopodite, with a small distal acumen. Blade of telopodite bent slightly mesiad. *In situ*, blades lie against each other and directed at right angles to the longitudinal axis of the body. In mesial aspect, a further distinction can be seen in the deep sinus on the base of the telopodite just behind the setiferous shoulder. Basal spine medium in size, borne on a small cephalolateral shoulder.

In life, dorsum very dark brown or black, with outer and cephalic margins of collum, caudolateral halves of keels, and tip of anal segment bright red. Underparts yellowish tan, legs becoming lighter distally, claws brown. Head dark brown above, margins of labrum light yellowish brown. Antennal sockets and first three articles yellow, becoming darker distally.

Type specimens.—Holotype and female allotype in the U. S. National Museum, No. 1803. Two male paratypes in my personal collection, No. 6-3047-1c. The allotype was collected by J. E. Graf on June 5, 1940, the others were taken on June 29-30, 1947, by Kleinpeter and me.

Type locality.—Burkes Garden, Tazewell County, Va. The tops of the surrounding mountains belong to the Canadian Zone. A specimen (the type) was taken at 4,600 feet on Beartown Mountain, in a very wet forest of maple-spruce-redbud association, with mesophytic herbs such as *Impatiens pallida*. The paratypes were found in Mill Gap, at 2,900 feet, in a hemlock-laurel association. The allotype was collected on Clinch Mountain (eastern rim of Burkes Garden) at 4,300 feet.

A. kleinpeteri shows no close relationships with any other known member of the genus. The gonopods represent, perhaps, a further development of the *picta* type; but the red and black coloration is unique for the genus.

I take pleasure in naming this handsome species for my good friend and tireless field companion, Hubert I. Kleinpeter, who secured the holotype as well as many other diplopods during our investigations.

APHELORIA PICTA, new species

PLATE 26, FIGURES 5, 6

Diagnosis.—A medium-sized species, characterized by the color pattern of yellow keels and large reddish median blotches, and by the gonopod of the male, which is very much recurved, slender, and bent mesiad and distad, with a conspicuous subterminal "heel."

Description.—Length of holotype, 41, width, 9.4 mm.; length of allotype, 39, width, 9 mm. Width of body averages 23 percent of length. Sides of body subparallel, segments 4 through 15 of full width. Keels moderately broad, continuing slope of dorsum, usually well separated. Anterior corners of keels rounded, posterior corners also somewhat rounded, not as sharply angular as in other species. Keels of segment 15 not produced caudally, those of 16 noticeably produced. Dorsolateral edges of keels raised into ridges; repugnatorial pores situated dorsally, at about middle of keel.

Collum with both cephalolateral and caudolateral margins tapering distally.

Anal segment triangular in dorsal aspect, longer than broad, its basal width approximately equal to distance between keels of the penultimate segment; truncate distally, bearing a few scattered tufts of setae. Anal valves slightly inflated, bearing a few scattered setae, their mesial margins raised into ridges each of which bears a single seta. Preanal scale triangular, somewhat longer than broad, with three terminal lobes of which the median one is conspicuously larger than the other two—in this respect agreeing with *A. antrostomicola*.

Bases of last pair of legs very slightly separated. Sternites and coxae unspined. Trochanters and femora spined. Legs terminating in a strong curved claw, with many stiff bristles around its base. Coxae of second pair of legs of males with the usual cylindrical knobs which in this species are flattened distally almost to the extent found in *antrostomicola*.

Gonopods resembling those of *antrostomicola* in being almost cylindrical and narrowly tapering, not flattened or bladelike and in being bent mesiad and distad in more than a complete circle; differing from *antrostomicola* in the curves of the telopodite being rather angular with straight interspaces and in the subterminal "heel," which gives the distal third of the appendage the appearance of an Oriental slipper. Base of telopodite with a mesial setiferous shoulder and a cephalolateral should which bears the basal spine.

Dorsum black, with caudolateral half of keels, tip of anal segment, and legs yellow. A large, reddish-orange crescentic blotch on posteromedian margin of each tergite. Collum with distal ends of dorsal surface yellow, and a dorsomedian hourglass-shaped marking of orange. Front of head black, margin of labrum brown. Antennae light brown, distal portions of the articles not white. Sternites posterior to gonopods tan (except last), sides of body brownish tan, anal valves brown.

Type specimens.—Holotype and female allotype in the U. S. National Museum, No. 1804. Additional male and female topoparatypes are in my personal collection, Nos. 6-2647-1, 7-247-1b. All specimens collected by Hobbs, Wilson, and Walton.

Type locality.—Mountain Lake, Giles County, Va. Most specimens collected near the University of Virginia Biological Station, with predominating forest cover of deciduous trees such as oak, maple, and yellow poplar. The undergrowth is largely of ericaceous shrubs. Mountain Lake is located on the top of Salt Pond Mountain, in central Giles County, at an elevation of about 3,800 feet.

Remarks.—This species has its closest affinities with *Apheloria antrostomicola*, from which it may be only subspecifically distinct. The similarities in pattern, gonopods, preanal scale, and coxal lobes all suggest such an association. The type localities for the two species are less than 40 miles apart and are in the same mountain range. Collecting in the intervening region will prove interesting, as it is not yet known whether *antrostomicola* occurs in humus away from limestone regions.

APHELORIA TRIMACULATA (Wood)

Polydesmus (Fontaria) trimaculata Wood, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, p. 6, 1864 (Susquehanna County, Pa.).

VIRGINIA: *Alleghany County*: McGraws Gap, 3 miles northwest of Clifton Forge, RHL Nos. 3-3047-3b, 5-1847-1b, 6-147-1b, 6-1447-1b, and 6-2147-1; *Augusta County*: Sherando Lake, near Lyndhurst, RHL No. 8-1547-1c (male and 2 females collected by Carr); *Elliotts Knob*, 10 miles west of Staunton (1 dead female seen in August 1947); *Bath County*: Douthat State Park, female seen June 15, 1947.

A. trimaculata has also been reported from Mountain Lake, Va., by Loomis (Psyche, vol. 51, p. 175, 1944). The accuracy of the locality data, however, is not beyond suspicion, inasmuch as a summer of very thorough collecting at Mountain Lake has not revealed any xystodesmids that might be considered *trimaculata*.

The specimens listed above are all rather large, exceeding previously published measurements. Since Wood's figure of the gonopod of *trimaculata* is not very useful for comparison with specimens, it seems advisable to relegate this large southern form tentatively to *trimaculata* until topotypic material can be examined.

A. trimaculata is a very common form near Clifton Forge, and on damp or rainy days one can observe many specimens out wandering around. At other times no special effort is needed to dig specimens out of the leaf mold. They are often seen on hemlock logs, but I have yet to find one inside a log. Large numbers of unpigmented young of this species are found during the spring months, becoming scarce later in the year, and specimens almost mature are very rarely seen. The change from seventh instar larvae to adults takes place during August. Mating occurs throughout the summer, from early in June through August.

Genus BORARIA Chamberlin

Boraria CHAMBERLIN, Proc. Biol. Soc. Washington, vol. 56, p. 143, 1943. (Genotype: *Aporiaria carolina* Chamberlin.)

Gonopod of male a relatively straight cylindrical process, abruptly tapering distally into a slender acumen, mesial side of telopodite with a slender distally directed spine.

BORARIA CAROLINA (Chamberlin)

Aporiaria carolina CHAMBERLIN, Bull. Univ. Utah, vol. 30, No. 2, p. 6, fig. 10, 1939 (Soco Falls, N. C.).

VIRGINIA: *Grayson County*: Mount Rogers, east side near top, RLH No. 7-147-1a (2 males).

As this species was originally described from Soco Gap Falls, near Waynesville, Haywood County, N. C., its discovery on Mount Rogers extends the known range considerably to the north, and suggests that the species will be found at intervening places. Both of the specimens at hand match Chamberlin's description and drawing perfectly.

Genus BRACHORIA Chamberlin

Brachoria CHAMBERLIN, Bull. Univ. Utah, vol. 30, No. 2, p. 3, 1939. (Genotype: *B. initialis* Chamberlin.)

Broad short species with posterior corners of keels of segments 1 through 12 rounded instead of angular; blade of telopodite of male gonopod with one or two joints, basal spine on the lateral side, not rising from a conspicuous shoulder.

BRACHORIA ETHOTELA (Chamberlin)

Brachoria ethotela CHAMBERLIN, Bull. Univ. Utah, vol. 32, No. 8, p. 5, 1942 (Marion, Va.)

VIRGINIA: *Tazewell County*: Burkes Garden, RLH No. 6-2947-2c (male and female).

This species was described from specimens taken at Marion, in Smyth County; thus the new material constitutes but a small extension of the range. The Burkes Garden specimens were found on Bear-town Mountain at an elevation of about 4,600 feet in wet deciduous woods.

Genus DELTOTARIA Causey

Deltotaria CAUSEY, Ent. News, vol. 53, p. 165, 1942. (Genotype: *Deltotaria brimleii* Causey.)

"This genus resembles *Apheloria* in the curvature and the length of the principal blade of the telopodite of the male gonopods, but differs in having a thin subterminal process on the blade. It differs from other genera of this family in that the gonopods bear a large

medial pointed coxal peg in addition to the characteristic sickle-like coxal spine." (Causey, *op. cit.*)

DELTOTARIA CORONATA, new species

PLATE 26, FIGURES 7, 8

Diagnosis.—Distinguished by the presence of three terminal processes on the telopodite blade and by the color pattern of black on the back, with the keels and anterior margin of collum bright yellow.

Description.—A somewhat longer and narrower form than the genotype. Length of holotype, 36, width, 8 mm.; length of allotype, 37.5, width, 8 mm. Width of body averages 21.5 percent of length.¹ Keels of the anterior and midbody segments with the corners rounded somewhat, those of the posterior segments with the posterior corners produced caudally. Keels of the penultimate segment small, not enclosing anal segment or enclosed by those of the antepenultimate segment. Dorsolateral edges of all keels slightly raised into ridges. Repugnatorial pores dorsal in position, about at midline of keel.

Collum slightly longer than succeeding segment, posterior margin rather straight in males, but tapering cephalad toward the ends in females.

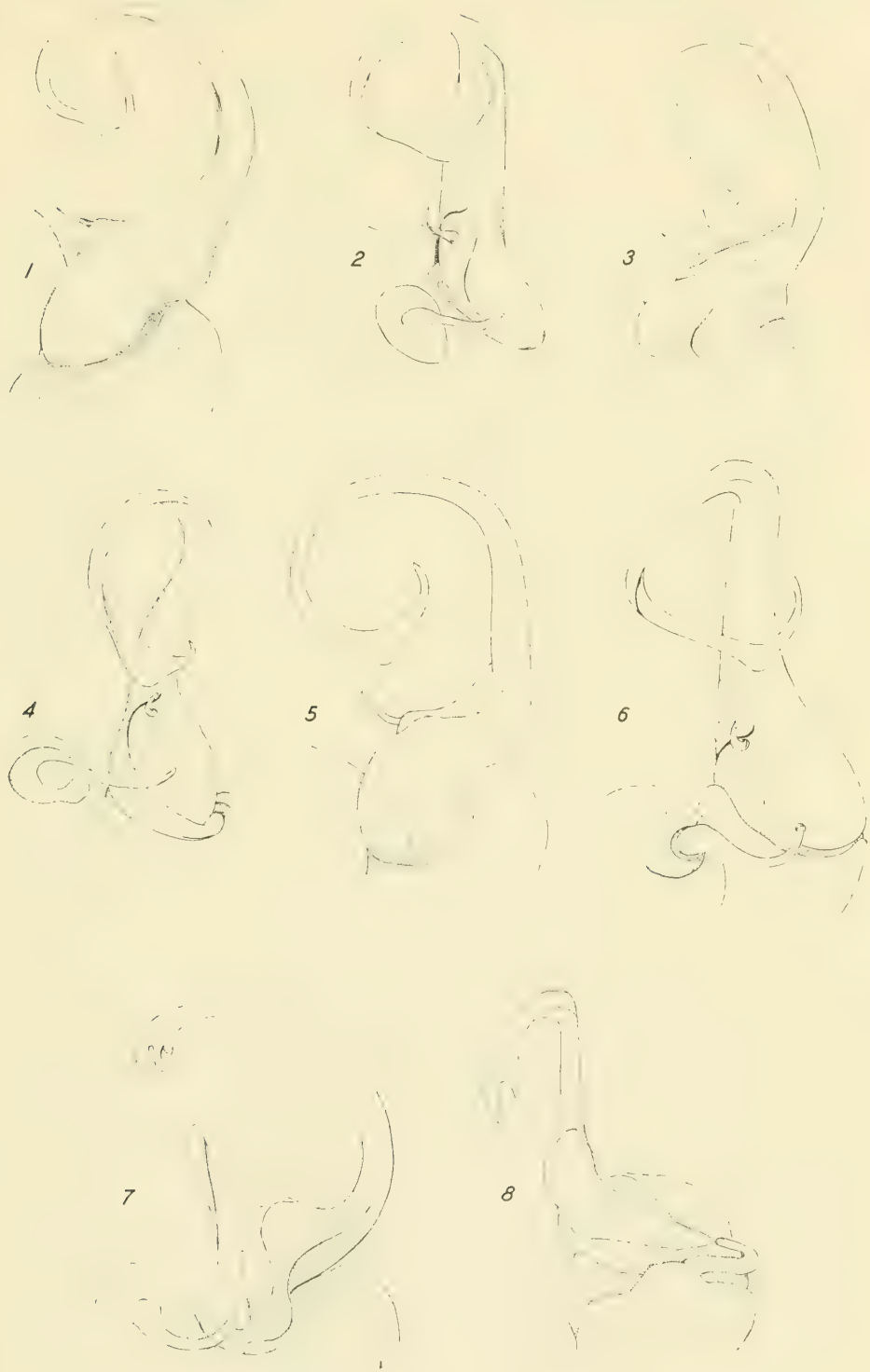
Anal segment triangular in dorsal aspect, longer than broad, the tip truncate and bearing a few setae. Anal valves glabrous, with the mesial margin of each produced into a ridge, not otherwise sculptured. Preanal scale broadly triangular, wider than long, with a median and two lateral lobes.

Bases of last pair of legs in contact mesially. Sternites very weakly spined, trochanters and femora strongly spined; legs with strong terminal claws. Coxae of second pair of legs of males with prominent rounded knobs.

Gonopods of male relatively large and prominent. *In situ* the main axis of the telopodite blade lies at a right angle to that of the body, the gonopods at rest having the blades in contact and frequently hooked together. The gonopod resembles that of *D. brimleyi* as figured by Causey (*op. cit.*, fig. 1) in general appearance but differs in having three terminal teeth on the telopodite, as well as a prominent knob between the coxal projection and base of the blade. Coxal projection large.

Dorsum glossy brownish black, with caudolateral two-thirds of keels, anterior margin of collum, and tip of anal segment lemon-yellow. Underparts yellowish tan. Head dark brown, except margin of labrum which is light brown; antennae light brown with distal portion of each article white. Claws of legs brown, sternites of a

¹ 27.5 percent in *brimleyi*, according to Causey's measurements. This is probably due to the dried and doubtless telescoped condition of the types.



GONOPODS OF NEW SPECIES OF APHELORIA AND DELTOTARIA

1, 2, *Apheloria antrostomicola* (1, mesial view; 2, cephalic view); 3, 4, *A. kleinpeteri* (3, mesial view; 4, cephalic view); 5, 6, *A. picta* (5, mesial view; 6, cephalic view); 7, 8, *Deltotaria coronata* (7, mesial view; 8, cephalic view). [Setae have been omitted to show basal structure more plainly.]



GONOPODS OF NEW SPECIES OF NANNARIA AND SIGMORIA

9, 10, *Nannaria ericacea* (9, lateral view; 10, cephalic view); 11, 12, *N. laminata* (11, lateral view; 12, cephalic view); 13, 14, *N. simplex* (13, lateral view; 14, cephalic view); 15, 16, *N. wilsoni* (15, lateral view; 16, cephalic view); 17, 18, *Sigmoria furcifera* (17, mesial view; 18, cephalic view). [Setae have been omitted to show basal structure more plainly.]

darker shade than legs. A faint dark spot in the yellow of the keels just above each repugnatorial pore.

Type specimens.—Holotype, female allotype, and a male paratype in the U. S. National Museum, No. 1805; additional paratypes are retained in my personal collection, Nos. 6-3047-2a, 7-147-1b, and 7-147-2a. Most of the above specimens were collected on June 30-July 1, 1947, but one female was found in the saddle between Mount Rogers and White Top Mountain on July 15, 1947, by Dr. L. R. Cleveland.

Remarks.—This attractive species is fairly common on Mount Rogers below the evergreen forest line, and was frequently seen out during the day, crawling on logs and across the trails. One evening four specimens were taken as they wandered about atop an old sawdust pile. A pair was seen in copulation on the night of July 1.

Deltotaria coronata is, apparently, the only xystodesmid milliped in eastern United States with the conspicuous and brilliant yellow band across the front of the collum. The specific name is given in recognition of the marking.

Genus NANNARIA Chamberlin

Nannaria CHAMBERLIN, *Psyche*, vol. 25, p. 124, 1918. (Genotype: *Nannaria minor* Chamberlin.)

Small, narrow-bodied forms characterized in part by the repugnatorial pores being lateral in position and by the uniform dorsal pattern of olive to black with the keels pink. The gonopods consist of a nearly straight slender lateral process and a smaller mesial process.

NANNARIA ERICACEA, new species

PLATE 27, FIGURES 9, 10

Diagnosis.—A large member of the genus characterized by the male gonopods, in which the telopodite is deeply bifurcated with the larger lateral process bearing a mesially directed terminal branch, and the smaller mesial process a simple flattened blade which reaches distad to the level of the branch of the lateral process.

Description.—Length of holotype, 30, width, 5 mm. Body width averages 16 percent of length. Segments between second and fifteenth of full width, body abruptly rounded in front, gently tapering behind.

Collum large, rounded in front, sides straight and with small marginal ridges; subtrapezoidal in dorsal aspect. Posterior margin indented across body, posterior corners angular. Collum not quite as long as two succeeding segments.

Second segment with keels shorter than tergite at midline, posterior edges of keels tapering cephalad, marginal ridges well developed. Segments 3 through 12 subsimilar, anterior corners of keels rounded, posterior corners directed slightly caudad; all keels with prominent

marginal ridges; keels extending caudad of median posterior portion of tergites. Segments 14 to 19 with posterior lobes equal in length to tergites at midline. All tergites comparatively flat and smooth. Repugnatorial pores lateral in position, in some cases directed slightly downward.

Anal segment triangular in dorsal aspect, longer than broad, its basal width less than distance between keels of penultimate segment; truncate distally. Anal valves inflated, glabrous, with many small ridges and grooves on cephaloventral portion of each. Preanal scale roughly triangular with very large terminal lobe. Mesial ridges of anal valves unusually large.

Bases of last pair of legs very close. Legs of segments 8 to 18 similar, sternites of posterior pair of legs on the segments with conspicuous processes; coxae and trochanters unarmed, femoral spines large. Distal tarsal joint shorter than basal two, shorter than femur. Coxae of second pair of legs of male with cylindrical processes, rounded distally. Males with sternites between fourth legs with high conical knobs. Pregenital legs much more hirsute than postgenital limbs, and with heavy, blunt claws.

Gonopods at rest lie parallel and directed cephalad, reaching to the sternites of the fifth pair of legs, the terminal branches of the lateral processes crossed. Telopodite composed of two elements: a small bladelike mesial process which projects distad from the mesial side of the lateral process to the level of the terminal branch of the latter. Lateral process an almost straight cylindrical shaft with a terminal, distally directed tooth and a large subterminal branch which is bent mesiad and cephalad. Base of telopodite with the usual lateral setiferous shoulder and other structures as shown in the drawings.

In life, tergites blackish (occasionally dark olive-gray with a median dark line), the keels red on both corners as well as margin; extreme edges of keels colorless; underparts of body whitish gray. Head black on top, brown in front with edges of labrum a lighter brown; antennae light brown with distal portion of each article white.

Type specimens.—Male holotype in the U. S. National Museum, No. 1784. Several topoparatypes in my personal collection, RLH Nos. 4-2747-1, 5-1847-1c, and 6-147-1a.

Type locality.—McGraws Gap, 3 miles northwest of Clifton Forge, Alleghany County, Va. A deep watergap in sandstone ridges, with the forest composed chiefly of *Tsuga canadensis*, *Liriodendron tulipifera*, *Quercus alba*, *Q. prinus*, *Acer rubrum*, *A. pennsylvanicum*, *Rhododendron maximum*, and *Kalmia latifolia*. Herbaceous plants at the type locality include *Urtica dioica*, *Mitella diphylla*, *Mitchella repens*, and the ferns *Polypodium virginianum* and *Polystichum acrostichoides*.

Remarks.—Although not confined to ericaceous habitats, this species is certainly most abundant in such places, and is found elsewhere only rarely. Certain other members of this genus share the predilection for ericaceous thickets (e. g., *N. wilsoni*, see below).

Judged from the nature of the gonopods, *Nannaria ericacea* finds its closest relatives in *N. scutellaria* Causey and *N. tennesseensis* (Bollman).

In addition to the type locality, I have found this species at the following Virginia localities: *Craig County*: Barbours Creek, 9 miles northwest of Newcastle; *Botetourt County*: Craig Creek Valley, 2 miles northwest of Eagle Rock. The range is doubtless general over central western Virginia.

NANNARIA LAMINATA, new species

PLATE 27, FIGURES 11, 12

Diagnosis.—A medium-sized member of the genus, characterized by the structure of the male gonopods, in which the telopodite consists of two subequal processes, the lateral process being slender, spini-form, and with the distal portion curved mesially over the end of the broad, flat mesial process.

Description.—Length of holotype, 27, width, 5 mm. Width of body about 18 percent of length. Segments between second and fifteenth of full width, body abruptly rounded in front, gently tapering behind.

Collum large, subtrapezoidal in dorsal aspect, sides straight and with conspicuous marginal ridges, front slightly rounded. Posterior margin interrupted (emarginate across body); posterior corners angular. Collum as long as succeeding two segments combined.

Second segment with keels shorter than tergite at midline, posterior edges of keels tapering cephalad, keels with well-developed marginal ridges. Segments 3 through 12 subsimilar, anterior corners of keels rounded, posterior corners directed slightly caudad; all keels with prominent marginal ridges; keels extending caudad of median posterior portion of tergites. Segments 14 to 19 with posterior lobes shorter than tergite at midline. All tergites comparatively flat and very smooth. Repugnatorial pores lateral in position, in some instances directed slightly downward.

Anal segment triangular in dorsal aspect, as long as broad, its basal width greater than distance between keels of the nineteenth segment, truncate distally, the tip somewhat excavated. Anal valves inflated, glabrous, with ridges and grooves on the cephaloventral portion of each. Preanal scale semicircular, with tubercules almost obsolete.

Bases of last pair of legs narrowly separated. Legs of segments 8 to 18 subsimilar; sternites of posterior pair of legs of each with robust spines, coxae and trochanters unarmed, femoral spines large; distal

tarsal joint longer than proximal two, and as long as femur. Coxae of second pair of legs of male with cylindrical, distally truncate processes. Sternites of fourth male legs with conical knobs. Pregenital legs more hirsute than posterior.

Gonopods *in situ* lie parallel and directed cephalad between the bases of the seventh pair of legs, the tips of the lateral processes crossed. Telopodite composed of two elements, a smaller bladelike mesial process, which, when seen in cephalic view, projects distad from mesial side of base of telopodite, the tip slightly acuminate and twisted, reaching almost to end of lateral process. Latter a spiniform mesially directed shaft, tapering distally from a cylindrical basal portion, on the base of which is the usual cephalolateral setiferous shoulder.

In life, tergites blackish; most of keels reddish pink. Underparts of body whitish gray. Head brown with a wide light margin along the edge of the labrum; antennae olive-gray with the basal and terminal articles white.

Type specimen.—Male holotype in the U. S. National Museum, No. 1806, collected by Hobbs and Wilson on July 12, 1947.

Type locality.—A deep, shady, steep-sided ravine beside U. S. Route 460, about 2 miles south of Glen Lyn, Va., in Mercer County, W. Va. Forest cover of deciduous trees such as maple.

Remarks.—This species is related to *N. simplex*, differing chiefly in the bladelike mesial process of the gonopod, and in having the front of the head with a wide light margin.

NANNARIA SIMPLEX, new species

PLATE 27, FIGURES 13, 14

Diagnosis.—A medium-sized member of the genus characterized by the structure of the male gonopods, in which the telopodite blade is deeply divided, the lateral process being longer and curved mesiad over the end of the short spiniform mesial process. Head entirely black.

Description.—Length of holotype, 27.7, width, 4.8 mm. Body width averages 17 percent of length. Segments between second and fifteenth of full width, body abruptly rounded in front, gently tapering behind.

Collum large, subtrapezoidal in dorsal aspect, sides straight with a very small marginal ridge, front slightly concave. Posterior margin emarginate across body; posterior corners angular. Collum as long as succeeding two segments combined.

Second segment with keels shorter than tergite at midline, posterior edges of keels tapering cephalad, lateral edges with well developed marginal ridges. Segments 3 through 15 subsimilar, anterior corners of keels rounded, posterior corners directed slightly caudad;

all keels with prominent marginal ridges; keels extending caudad of median posterior portion of tergites. Segments 14 to 19 with keels becoming increasingly produced caudally, those of 19 with posterior lobes equal in length to tergite at midline. All tergites comparatively flat, and very smooth (except 18 and 19, which have tiny tubercles). Repugnatorial pores lateral in position, in some instances directed slightly downward.

Anal segment triangular in dorsal aspect, as long as broad, its basal width greater than distance between keels of segment 19, truncate distally. Anal valves inflated, glabrous, with ridges and grooves on cephaloventral portion of each. Preanal scale semicircular, with tubercles almost obsolete.

Bases of last pair of legs widely separated. Legs of segments 8 to 18 similar; sternites of posterior pair of legs with conspicuous spines, coxae and trochanters unarmed, femoral spines large. Distal tarsal joint longer than basal two, and as long as femur. Coxae of second legs of male with cylindrical, distally truncate processes. Sternites between fourth pair of legs of males with low rounded knobs. Pre-genital legs much more hirsute than postgenital limbs.

Gonopods *in situ* lie parallel and directed cephalad between the bases of the seventh pair of legs, with distal ends in contact or crossed. Telopodite composed of two elements: a small spiniform mesial process which projects distad from the inner base of the telopodite, reaching almost as far distad as end of the lateral process. Latter a larger, mesially directed spine, tapering gently distally. Basal portion subcylindrical, with the usual lateral setiferous shoulder.

In life, tergites blackish, this color extending onto the keels in a blunt wedge, there replaced on both corners as well as lateral margin by reddish pink. Extreme edges of keels colorless. Underparts of body whitish gray. Head almost completely black. Antennae brown, first article white.

Type specimen.—Male holotype in the U. S. National Museum, No. 1807, collected by me on June 19, 1947.

Type locality.—McGraws Gap, 3 miles northwest of Clifton Forge, Alleghany County, Va. The locality is described under *Nannaria ericacea* (q. v.).

Remarks.—The occurrence of two species of *Nannaria* in the same ecological niche at the same locality is of some interest. As might be expected, this species differs from its congener (*ericacea*) in several respects other than the fundamental one of the male gonopods.

The following differences will separate females as well as males:

N. ericacea: Head brown, edged with tan along labrum, bases of last pair of legs almost in contact, preanal scale broadly triangular.

N. simplex: Head black to margin of labrum, bases of last pair of legs widely separated, preanal scale more acute.

Nannaria simplex appears to be quite scarce. Despite many frequent searches at the type locality (which have produced many specimens of *ericacea*) only the holotype has been found. It was discovered under a small bit of hemlock bark, and when uncovered ran off with some show of celerity.

NANNARIA WILSONI, new species

PLATE 27, FIGURES 15, 16

Diagnosis.—A medium-sized member of the genus, characterized by the male gonopods, which are deeply bifurcated with the lateral process larger, the distal portion becoming flattened and twisted on its axis. Mesial process smaller, a simple spiniform branch.

Description.—Length of holotype, 25, width, 5 mm. Body width averages 20 percent of length. Segments between second and fifteenth of full width, body abruptly rounded in front, gently tapering behind.

Collum large, subtrapezoidal in dorsal aspect, sides straight and with very small marginal ridges; front slightly convex. Posterior edge emarginate across body; posterior corners angular. Collum as long as succeeding two segments combined.

Keels of segments anterior to fourteenth shorter than tergites at midline; posterior edges of keels tapering cephalad; lateral edges with well-developed marginal ridges. Segments 3 through 13 subsimilar, anterior corners almost square, posterior corners directed slightly caudad. Segments 14 through 19 with keels becoming increasingly produced caudally, those of 19 with posterior lobes large and bluntly rounded. All tergites comparatively flat, and very smooth. Repugnatorial pores lateral in position, in some instances directed slightly downward.

Anal segments triangular in dorsal aspect, as long as broad, its basal width less than distance between keels of penultimate segment, truncate distally. Anal valves inflated, glabrous, with small ridges and grooves on the cephaloventral portion, mesial ridges very large. Preanal scale triangular, more pointed than in *simplex*.

Bases of last pair of legs relatively close. Legs of segments 8 to 18 subsimilar; sternites of posterior pair of legs of each segment with conspicuous spines; coxae and trochanters unarmed, femoral spines large. Distal tarsal joint longer than basal two, and as long as femur. Coxae of second pair of legs of males with cylindrical, distally truncate processes. Sternites of fourth pair of legs of males with conical processes which are ovoid in cross-section. Pregenital legs much more hirsute than postgenital limbs, and terminating with heavy blunt claws.

Gonopods *in situ* lie parallel and directed cephalad between the bases of the sixth pair of legs. Tips may be in contact or crossed. Telopodite composed of two elements: a smaller spiniform mesial process which projects from the inner side of the lateral process and reaches distad almost to the end of the latter. Lateral process a cylindrical, almost straight shaft, the distal third of which is bent cephalad and is flattened and twisted on its axis.

In life, tergites blackish, keels reddish pink on both corners as well as margin, extreme edges of keels colorless. Underparts of body whitish gray. Head yellowish gray, only the top black. Antennae olive-gray, first and last articles white.

Type specimens.—Holotype and male paratype in the U. S. National Museum, No. 1808. Six additional topoparatypes in my personal collection. This material was secured by Hobbs, Walton, and Wilson in June and July 1947.

Type locality.—Mountain Lake, Giles County, Va. The region is described under *Apheloria picta* (*q. v.*) Most specimens taken in the vicinity of the University of Virginia Biological Station.

Remarks.—In addition to the type locality, *Nannaria wilsoni* is known from the following locality: VIRGINIA, *Floyd County*: Rocky Knob Recreation Area, Blue Ridge Parkway, 6 miles southeast of Floyd. Several males and females (RLH No. 7-347-1b) were obtained by Hubert Kleinpeter and me on July 3, 1947. They were found in leaf mold and under small stones in a dense thicket of rhododendron and mountain laurel at an elevation of about 3,000 feet.

The gonopods of *wilsoni* are not similar to those of any presently known member of the genus.

Genus SIGMORIA Chamberlin

Sigmoria CHAMBERLIN, Bull. Univ. Utah, vol. 30, No. 2, p. 7, 1939. (Genotype: *Sigmoria munda* Chamberlin.)

Telopodite of male gonopod an upright sigmoidally curved blade. Base of telopodite with a lateral spur or spine. The species are usually large with wide keels.

SIGMORIA FURCIFERA, new species

PLATE 27, FIGURES 17, 18

Diagnosis.—A medium-sized species, distinguished by the structure of the male gonopod, the basal spine of which is bifurcated, and the telopodite blade bearing a small tooth on the mesial margin, which is produced into a large rounded lobe.

Description.—Length of holotype, 40, width, 10.5 mm. Body width averages 23 percent of length. Segments 4 through 16 of full

width, anterior end abruptly rounded, posterior end gently tapering back to nineteenth.

Collum lens-shaped, not so long as two succeeding segments combined, its posterior margin shallowly indented mesially; outer ends directed slightly caudad. Collum and next segment without raised edges on the keels.

Dorsum coriaceous under low magnification; segments with wide keels, slightly overlapping. Anterior corners rounded, posterior corners angular, becoming caudally produced behind segment 15; dorsolateral edges of most keels raised into ridges which are broader on poriferous segments; repugnatorial pores dorsal in position, located near the middle of the swelling. Keels of segment 18 almost enclose those of 19.

Anal segment triangular in dorsal aspect, longer than broad, its basal width less than distance between keels of segment 19, truncate distally, bearing a few terminal setae. Anal valves slightly inflated, glabrous, unsculptured. Mesial edges produced into the usual ridges. Preanal scale broadly triangular, almost semicircular, with one terminal and two lateral tubercles, latter very small.

Bases of last pair of legs narrowly separated. No sternal or coxal armature, trochanters and femora with medium-sized spines. Tarsi with strong terminal claws, distal podomere very hirsute. Coxae of second pair of legs of male with low rounded knobs.

Gonopods of male large and conspicuous, *in situ* lying parallel and directed cephalad between bases of seventh pair of legs. Telopodite a slender flattened blade, bent cephalad and mesiad, lateral side with a large lobe and tooth; tip of blade truncate. Base of telopodite with an oblique transverse cephalic ridge, which terminates mesiad in a large bifurcated spine; a large lateral setiferous shoulder.

Dorsum black in life, with caudolateral two-thirds of keels, anterior edge of collum, and tip of anal segment reddish orange. Posterior margins of keels with tinge of yellow. Underparts generally yellowish tan, with legs becoming brighter distally. Head brown, antennae and edges of labrum lighter brown.

Types specimen.—Male holotype in the U. S. National Museum, No. 1809, collected by Hobbs and Wilson on July 12, 1947.

Type locality.—Near Pineville, Wyoming County, W. Va. According to field notes, the species was associated with a form of *Brachycybe*, in beech woods.

Remarks.—In color, size, and general configuration of the male gonopods, this species is quite close to *S. conclusa* Chamberlin from Altapass, Tenn., of which it may prove to be a subspecies. From *conclusa*, *furcifera* differs in the broader telopodite blade which lacks spines or teeth on the lateral margin, and in having the basal spine

larger and more conspicuously forked. Unfortunately, no details can be made out from Chamberlin's figure of *conclusa*.²

Genus ZINARIA Chamberlin

Zinaria CHAMBERLIN, Bull. Univ. Utah, vol. 30, No. 2, p. 4, 1939. (Genotype: *Z. urbana* Chamberlin.)

Gonopod of male a simple cylindrical upright shaft, bifurcated distally; with a long slender basal spine.

ZINARIA BUTLERI (McNeill)

Polydesmus butleri MCNEILL, Bull. Brookville Soc. Nat. Hist., vol. 3, p. 6, 1888.

VIRGINIA: *Giles County*: Mountain Lake, RLH No. 7-247-1a; *Louisa County*: 4 miles north of Louisa, RLH No. 7-1247-1 (1 male). WEST VIRGINIA: *Wyoming County*: Pineville (2 males collected by Hobbs and Wilson).

Insofar as the structure of the gonopods goes, all the specimens listed above closely resemble the figure of *Fontaria virginiensis* (= *butleri*) given by Williams and Hefner (Ohio Biol. Surv. Bull. 18, 1928).

Z. butleri is a species with a very wide range and it occupies a diversity of habitats. The Louisa County locality, which I have visited, is situated in a region of extensive dry pine woods.

² Bull. Univ. Utah, vol. 30, No. 2, fig. 22.



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A REVIEW OF THE COPEPOD GENUS *PARANTHESSIUS* CLAUS

By PAUL L. ILLG

THE problem of arriving at a natural classification of the copepods has been in no small measure complicated by the repeated appearance within the group of the parasitic and commensal habit. In the cyclopoids, two sections, the *Poecilostoma* and the *Siphonostoma*, have been established and remain well differentiated on the basis of the specialization of mouth appendages correlated with parasitic and semiparasitic existence. Unfortunately for the systematist, these copepods seem to exhibit the widest tolerance in the selection of hosts. From the records, any phylum above the Protozoa which is represented to any conspicuous degree in the marine fauna is likely to appear in the roster of hosts of cyclopoid symbionts. This diversity of occurrence, in addition to small size, inconspicuous appearance, and remarkable agility in eluding usual methods of capture, has resulted in a scattered and fragmentary representation of this group in museum collections and consequently in the literature on copepods. The most extensive reports to date either have been surveys of the faunas of fairly limited localities or have been compendia of the symbionts of some particular category of host, with the emphasis of interest frequently tending toward the host rather than toward the copepod.

Probably a high degree of artificiality has been introduced into the classification because of this history. One of the major groups of the copepods is now found defined in numerous publications as an assemblage of parasites and commensals of ascidians. This reference is, of course, to the *Notodelphyoida*, which in such broad interpretation

includes many degenerate parasites. The actual affinities of many of these may very well prove to be with several of the main stocks of the copepods when more emphasis is placed upon the details of structure rather than upon the fortuities of ecological distribution.

The copepods here considered are cyclopoids that show a tendency to reduction of mouth appendages: this character defines the section *Poecilostoma*. In these copepods the traits unifying the group are the very features that provide the most vexing of technical difficulties to the investigator. It is essential for any coherent presentation of the relations of the poecilostomes to establish the details of structure of the mandibles, maxillules, maxillae, and maxillipeds. These appendages are simplified in construction, reduced in size to minute proportions, closely appressed, and wedged into a very small area with closely impinged surrounding structures, such as a labrum which envelops a great part of the oral space. Dissection is the only satisfactory means of elucidating these features, because the normal arrangement of the mouth parts is such that most are held somewhat perpendicular to the axis of the body and even the best *toto* views often lead only to confusion of the details.

The present collection comprises symbionts of pelecypod mollusks. They were obtained, however, as a portion of a series of poecilostomes collected in association with a diverse array of invertebrates from the Pacific coast of North America. The forms are all assigned to the genus *Paranthessius* Claus, according to the definition to be established here. Noteworthy is the fact that congeners of these commensals of mollusks have been described as living in association with coelenterates, holothurians, and ascidians, evidencing the tendency in the poecilostomes to diversity of host organisms.

The genus *Paranthessius* is perhaps one of the most generalized of all the diverse copepod types customarily assigned to the family Lichomolgidae. In the structure of the mouth parts there is found as simplified and basic a plan as is encountered elsewhere in the family. The arrangement of the swimming legs of some of the representatives is possibly the least specialized among lichomolgids. I refer here to species in which the armature of the fourth endopodite retains on the terminal segment five outgrowths (setae or spines). A prominent character of most of the species of the genus is the tendency to suppression of the ornamentation of the fourth endopodite. In the extreme condition of this modification, existing in several *Paranthessius* species, the armature of the terminal segment of the fourth endopod is reduced to two outgrowths.

The subdivision of the Lichomolgidae proposed by Gurney (1927) into Sabelliphilinae and Lichomolginae would place *Paranthessius* in the former subfamily. This separation does not, I feel, follow a

strongly characterized natural tendency of the group but, rather, cuts across a well-discernible trend. Consideration of species of *Anthessius* Della Valle (synonym: *Pseudomolgus* Sars, Wilson, etc.) as typical lichomolgids has perhaps contributed to this viewpoint. I suggest that a more significant subdivision would set aside *Anthessius*, *Rhinomolgus* Sars, perhaps *Panaetis* Stebbing, and other genera, as well distinguished from the Lichomolgidae proper, either as a family or subfamily. The forms retained in the *Lichomolgus*-line follow, without necessity of subdivision, several trends which may or may not be of generic value but are hardly of familial or subfamilial importance. Such trends all seem to have strong foreshadowing in the genus *Paranthessius*. A conspicuous example would be the series exhibiting suppression of the fourth endopodite, as discussed above. Again, a series may be selected in which is traced the progressive transfer of the prehensile function from the terminal podomere of the antenna to the penultimate segment. Suggestions of various trends of modification of the rostrum are apparent. Such species as *P. sawidomae*, *P. robustus*, and *P. serendibicus* perhaps anticipate the great circular expansion in outline of the anterior body region, seen characteristically in the *Stellicola* section of *Lichomolgus*. *P. columbiae*, particularly in the adult female, shows the tendency of elongation and narrowing of the body in the direction of vermiform construction found in some of the most aberrant of the parasitic copepods. This trend is further suggestive of significance when it is noted that an accompanying phenomenon is the extension of the ovarian (or oviducal?) structure out into the full extent of the abdomen.

Family LICHOMOLGIDAE Claus

Genus *PARANTHESSIUS* Claus

- Paranthessius* CLAUS, 1889, pp. 342-343 (type, *P. anemoniac* Claus, 1889).—CANU, 1891, p. 479; 1892, p. 236; 1894, p. 137; 1898, pp. 413-415.—ZULUETA, 1912, p. 12.—MONOD and DOLLFUS, 1932, pp. 143-146.—WILSON, 1932, p. 587.—ATKINS, 1934, p. 674.—LEIGH-SHARPE, 1935, pp. 47-48.—NICHOLLS, 1944, p. 53. (Not *Paranthessius* T. Scott, 1903, p. 130.)
- Diogenidium* EDWARDS, 1891, pp. 89, 93 (type, *D. nasutum* Edwards, 1891).—CANU, 1891, p. 479; 1892, p. 236.—WILSON, 1932, p. 587.
- Herrmannella* CANU, 1891, pp. 479-480 (type, *H. rostrata* Canu, 1891); 1892, pp. 235-236.—T. SCOTT, 1894, p. 259.—CANU, 1899, p. 73.—NORMAN and SCOTT, 1905, p. 299.—T. SCOTT, 1906, p. 354 (part).—PELSENEER, 1929, pp. 35, 43.—FRASER, 1932, p. 279.
- Herrmannella* CANU, 1891, p. 436; 1894, pp. 3, 10.—THOMPSON and SCOTT, 1903, pp. 282-283 (part).—NORMAN and SCOTT, 1906, p. 199 (part).—SARS, 1918, pp. 174-175 (part).—BRIAN, 1924, p. 5.—WILSON, 1932, p. 586.—HEEGAARD, 1944, pp. 361, 365.
- Herrmannella* T. SCOTT, 1903, p. 28.—PELSENEER, 1929, p. 45.

- Lichomolgus* (part) T. SCOTT, 1892, pp. 266-267.—T. and A. SCOTT, 1892, pp. 201-203.—HERDMAN, 1893, pp. 83, 135.—THOMPSON, 1893, pp. 177, 207-208.
- Pseudolichomolgus* THOMPSON, 1897, cited in Herdman, 1897, p. 87 (type, *P. columbiae* Thompson, 1897).—WILSON, 1932, p. 591.
- Pseudolichomolgus* PESTA (not Thompson), 1909, pp. 263-265 (type, *P. pectinis* Pesta, 1909).—PELSENEER, 1929, pp. 35, 44.
- Pestalichomolgus* WILSON, 1932, p. 587 (new name for *Pseudolichomolgus* Pesta; type, *P. pectinis* (Pesta, 1909)).

Diagnosis.—Body shape cyclopoid. Segmentation somewhat variable; metasome 4- or 5-segmented; urosome of female 5-segmented, that of male 6-segmented. Rostrum well developed with obvious prehensile function. Antennule 7-segmented. Antenna of four segments, second always longest. Labrum deeply divided in the midline. Mandible constructed on simplest lichomolgid type, elongated, with tapering flat blade arising from a fairly stoutly chitinized base, with no articulation. Edges of mandible serrate, finely dentate or ciliate. Maxillule, inserted directly on head rather than on mandible, consists of flat palplike appendage; terminal armature various, comprising two or three setae. Maxilla 2-segmented, base very large and conspicuous. Two setae typically present on second segment, the more distal usually with a row of spinules or cilia on its medial margin; proximal seta not thus ornamented. Maxilliped of female considerably reduced, its segmentation varying among the species. Terminal podomere a pointed, spinelike segment, or bluntly rounded. Male maxilliped 3-jointed, prehensile. Swimming legs all biramous, trimerous, with characteristic modification of fourth endopodite. Fifth leg a single free segment, base represented only by a slight expansion of the body proper, basal seta present, borne on dorsal side of appropriate body segment. Armature of free segment two members, usually a conspicuously heavy spine and a seta.

Genotype.—*Paranthessius anemoniae* Claus.

Remarks.—The wide definition of *Paranthessius* as here offered presents some difficulties in the possibility of inclusion of *Modiolicola* Aurivillius and *Sabelliophilus* Sars. The latter genus stands fairly well alone by virtue of the following characters: The rostrum (bifid); the antennule (proximal two segments expanded); the antenna (prehensile hooks on both third and fourth segments); and the ornamentation of the maxilla (fairly spinous). Its remaining appendages would fit with no difficulties in the normal variations of the species of *Paranthessius*. Many years of usage make it most desirable to retain the generic distinction. *Modiolicola* presents even less strong separation, and it is possible that a further broadening of the definition of *Paranthessius* to include the forms now placed in *Modiolicola* may become desirable. However, as I am convinced that the number of undescribed species of lichomolgids is greater than the number now

known to science, I consider it is entirely probable that generic limits will be subjected to review and revision on future occasions. The group *Modiolicola*, therefore, serves for the present to set aside obviously related, well-characterized species which differ principally from those of *Paranthessius* as follows: Absence of a rostrum; possession of the highly characteristic antenna, with very much shortened second segment, accompanied by elongation of the third and fourth segments, and lack of armature on the third segment; and the reduction of the armature of the maxilla to a single unornamented seta.

There is a notable tendency to grouping of the species of *Paranthessius* within the limits set forth above. Subgeneric division is hardly justified because of the existence of transitional species. In six species the armature of the distal segment of the fourth endopodite, consisting of some combination of setae or spines to the total number of four or five, is developed. In the forms with four spines or setae, further, the outline of the segment characteristic of the full armature of five persists. In all these species there is reduction of the prehensile function of the terminal antennal segment, the usual strong claw being replaced by a group, typically three, of long setae, or weakly clawed slim spines. In some of these examples, but not all, the prehensile function is transferred to the penultimate antennal segment and the terminal joint then reduced to palplike dimensions.

The remaining species form a fairly coherent group characterized by reduction of the distal segment of the fourth endopodite, both in general outline, and in its armature, which is reduced to two or three spines or setae. In all but one of these species the terminal antennal segment bears a heavy prehensile claw, and the penultimate segment is the shortest and least developed. *Paranthessius parvus* (Norman and Scott) bridges the distinction between these groups, however; in that species, the prehensile function of the terminal segment is lost, although the terminal endopodite segment of the fourth leg has the spine complement reduced to two.

In its body outline *Paranthessius* is characteristically cyclopoid, or better, lichomolgid. An oval-shaped forebody is typical; in some species there is a tendency to elongation, and in others toward inflation of the outline of this region to an approximate circle.

The segment of the first swimming leg (the second thoracic segment—almost invariably called first segment by earlier authors) in some species is joined to the cephalothorax, in others is a free segment like the other pedigerous somites. The metasome then possesses three or four free segments posterior to the cephalothorax. Thoracic segment 5 is much the smallest of all. Frequently the greatest width of the metasome is at the first free segment.

The conspicuous rostrum of *Paranthessius* is bent downward and backward as a strong, pointed beak or hook, and, from the arrangement of the supporting structures, obviously enjoys considerable freedom of movement. It thus becomes an important prehensile structure in this genus. The chitinous bars and articulating masses on the ventral surface of the head which support the rostrum include in close association bars that are related to the bases of the antennules and antennae. Running backward in the midline as far as the upper lip is a broad straplike plate of chitin which, at its anterior end, is rounded to form a very mobile articulation with the beak proper (fig. 34, F). Curiously, Scott and Scott (1892) in their description of *Lichomolgus agilis* Scott (not Leydig) [= *Paranthessius rostratus* (Canu)] interpreted the rostrum as a "short trumpet-shaped siphon, capable of being extended or depressed * * *" Canu, in his monograph, illustrated the rostrum very well (Canu, 1892, pl. 24, fig. 3).

The antennules are 7-segmented. The third segment is usually the shortest; often it exhibits a great tendency to fusion with the adjacent segments. An apparent trend is the stressing of the articulation between segments 4 and 5, with the formation of a basal group (actually inflated in some species) and with the terminal segments arranged as a slenderer, more freely movable unit.

The antennae are 4-segmented and there is a highly complicated articulation with the ventral surface of the head. In some dissections a considerable mass of the articulating region may come free with the appendage, suggesting a fifth, basal segment. In the descriptions of various of the species a 5-segmented antenna is mentioned or depicted, and I suggest that this interpretation is due to such an artifact. The four terminal segments are similar, in any case. The first (basal) segment is short; the second is the longest of all, frequently somewhat flattened in a plane parallel to the body axis (in the normal orientation of the appendage) and at the same time expanded mediolaterally. The arrangement and ornamentation of the two terminal segments follow various trends, as has been described above.

The original description of *Paranthessius* Claus, 1889, was based upon one of the most aberrant representatives of the genus, and as a result, to the present, no satisfactory, complete resolution of the subsequent multiplication of synonyms has been brought forward.

The lichomolgid nature of *Paranthessius* was emphasized by its author, and very properly so, since, as has been pointed out above, reference to the amplified characters of the genus will show it to exhibit in most fundamental arrangement the defining structures of this much-abused family. A "Lichomolgus-like" body shape is typical of *Paranthessius* in Claus' sense. Further characters of his definition to which we must still adhere would be the rostrum, antennule, antenna

(although it is rather at the extreme of one of the trends of modification pointed out above), mandible, maxillule, maxillipeds of the two sexes, and the remaining thoracic limbs (although here the exceptional armature of the second segment of the fourth endopodite remains unique).

In *P. anemoniae* Claus some features that distinguish it markedly from most members of the genus were included in the generic diagnosis. The maxilla is unique, the more distal of the two setae of the terminal joint being enlarged to equal in dimension and arrangement of ornamentation the terminal prolongation of the main mass of the segment proper, which, further, has the appearance of being jointed basally. It is very difficult to reconcile this structure with the usual condition in lichomolgids, but Claus' description is supported by an account of Canu (1898), which is accompanied by a figure comparable to that presented with the original description. The armature of the fourth endopodite of *P. anemoniae* also sets this form apart from all others of the genus; indeed, is remarkable among the members of the family Lichomolgidae. The first segment (basal) bears the usual seta distally placed on the medial margin. The second segment bears two medial setae. All other species referred in the present treatment to *Paranthessius* bear a single seta on this segment, and this last condition is typical also of members of *Lichomolgus*, *Modiolicola*, and *Sabelliphilus*, genera perhaps most closely related to *Paranthessius*. All members of the genus *Anthessius* have the setae in question exactly like those of *P. anemoniae*, but in my estimation *Anthessius* is so distinct from typical lichomolgids that I incline to the establishment of a family, or at least a subfamily, for this genus and its allies. In all other characteristics, *P. anemoniae* is a lichomolgid without question, and I should consider it a dubious benefit to single out the species for generic status. Moreover, the unusually wide range of variability among the representatives of the genus should provide latitude for the reception of Claus' species.

Diogenidium Edwards, 1891, was instituted apparently without knowledge of the description of *Paranthessius*, although the author acknowledges consultation with Claus on systematic points dealing with other copepods described in the same paper. *D. nasutum* conforms well to the generalized characteristics of *Paranthessius* in its present sense. Various details were not included in the description; the mouth parts, for example, were dismissed as like those of *Lichomolgus*. One slight inconsistency occurred—the generic diagnosis cites an 8-segmented antennule, but the species description and the illustrations present the antennule as 7-jointed. The characteristic rostrum is present and well developed. The segmentation of the fourth endopod is typical, and the character of three outgrowths on

the terminal segment is shared with several more recently described species.

Herrmannella was established by Canu, 1891. Its distinction from *Paranthessius* was implied by the author's statements and *Diogenidium* was represented as differing generically by the configuration of the mid-region of the body and the nature of the mouth parts. In its particulars his characterization of *Herrmannella* and his species *H. rostrata* is a description of a generalized *Paranthessius*. His claimed differentiation from *Diogenidium* is not supportable, and any treatment that removed *P. ancmoniae* Claus to separate rank would have to admit the priority of *Diogenidium* over *Herrmannella*.

Canu, in his impressive monograph of 1892, republished his diagnosis of *H. rostrata*, amplified and illustrated, and stated specifically his bases for separation of the genus from *Paranthessius*—the antennule, maxilla, and the fourth endopodite. He repeated here his vague differentiation from *Diogenidium*, admitting the close relationship of the genera, the situation paralleling, in his statement, the resemblance of *Paranthessius* to *Anthessius*.

The subsequent synonymy of *Paranthessius* involves a number of obvious misinterpretations, most of the authors usually bringing forward subsequent corrections. One feature lending a certain flavor to this synonymy is the variety of lapses in transcription of *Herrmannella*, its author himself leading off the distinguished procession of those dropping out one or another of the improbable-appearing doubled consonants.

Most of the species described for the genus have been instituted under *Herrmannella* (Scott, Thompson and Scott, Sars). In these treatments a frequent error was the inclusion in the generic concept of species more properly assignable to *Anthessius*. This error probably was due to the condition of the fourth endopodite, the segmentation, as we have seen, being the same in the two genera.

The name *Pseudolichomolgus* was proposed twice for representatives of *Paranthessius*. I am convinced that specimens in my collection are either identical with *Pseudolichomolgus columbiae* Thompson (which was an immature stage) or are representatives of an exceedingly closely related species. In the adult condition these specimens can be assigned without question to *Paranthessius* (see further discussion under species).

Sars' concept (1918) of *Herrmannella* (sic) would apply, in general, from evidence of species considered, to *Paranthessius* as here defined, except for his mention, in discussion only, of *H. maxima* (Thompson), a synonym of *Modiolicola inermis* Canu. Sars had never seen specimens of this species. His generic diagnosis is very superficial, hardly serving more than to establish the genus in the Lichomolgidae and to differentiate it weakly from *Modiolicola* (*M. insignis* Aurivil-

lius). He claimed importance for the rostrum as a generic character but did not describe or illustrate the structure for any of the five species that he otherwise completely depicted with his customary meticulous care.

The most important synthesis of the scattered synonymy of *Paranthessius* was offered by Monod and Dollfus (1932) in their survey of the parasites of mollusks. They (pp. 143-146) refuted Canu's differentiation of *Herrmannella* from *Paranthessius*, pointing out parallel extremes of variation in *Lichomolgus* and further demonstrating that inclusion of Sars' *Herrmannella* species in the concept of the genus broadens it amply to receive *P. anemoniae*. They also added *Pseudolichomolgus* Pesta, 1909, to the synonymy of *Paranthessius*.

The interpretations of Heegaard (1944) require comment with reference to *Paranthessius*. This author's *Scambicornus* exhibits many traits which come within the defined limits of *Paranthessius*. Unfortunately, the types were not dissected, and the lack of information about the mouth parts requires assigning the form as a *genus incerta sedis* among the Lichomolgidae, if it belongs in that family, as the author claims. As they are illustrated, admittedly somewhat indefinitely, the mandible and maxilla of *Scambicornus* are not like those typical for the family Lichomolgidae. The fourth endopodite, as depicted in the illustrations, has an armature that does not appear elsewhere among lichomolgids. If these features could be clarified, it seems possible that *Scambicornus* may be related to *Paranthessius*.

More pertinent to present considerations on *Paranthessius* is the invoking by Heegaard of the structure of the antenna of *Herrmannella prehensilis* Sars, as figured by its author, in support of Heegaard's proposition that such an antenna is a biramous appendage bearing an exopodite and an endopodite. Sars' *H. prehensilis* has patently an antenna in which the prehensile function has been transferred from the stout claw typically borne on the terminal segment to a correspondingly developed hooked spine on the penultimate segment, with the end segment undergoing reduction to a short, palplike, setiferous member. The illustrations in the original descriptions of *H. serendibica* and *H. robusta* of Thompson and Scott (1903) are in agreement with Sars' presentation. There seems to be no advantage in departing from the traditional concept of the uniramous structure of the antenna. The genus *Paranthessius* offers an array of species in which may be traced very fully the tendency of transfer of prehensile function from the ultimate segment to the penultimate. A further support to the accepted view may be found in the condition of the antenna in the family Clausidiidae where an expanded third segment with fairly profuse ornamentation ordinarily dominates in size the more palplike terminal segment.

KEY TO THE SPECIES OF *PARANTHESSIUS*

(Based on characters of females)

1. Armature of terminal endopodite segment of fourth leg consisting of 2 spines or setae or a spine and a seta----- 2
 Armature of this segment consisting of 3 spines or 2 spines and a seta--- 10
 Armature of this segment consisting of 4 spines or setae----- 12
 Armature of this segment consisting of 5 spines or setae----- 13
2. Terminal antennal segment bearing heavy prehensile claw----- 3
 Terminal antennal segment without usual heavy claw, bearing instead 3 jointed setae of about equal size----- *parvus* (Norman and Scott)
3. Caudal rami 2 or more times as long as wide----- 4
 Caudal rami no more than one and one-half times as long as wide.
validus (Sars)
4. Rostrum a strongly curved, posteriorly directed, heavily chitinated beak----- 5
 Rostrum replaced by a gently curved, short prominence accompanied by a bifurcate, weakly chitinated accessory structure.
perplexus, new species
5. Fifth leg the usual slightly modified cylinder, or with base expanded---- 6
 Fifth leg characteristically shaped: in outline an inverse truncated cone, the squared-off terminal surface about twice as wide as base.
cynthiae (Brian)
6. Length of longest antennal segment much more than twice width----- 7
 Length of longest antennal segment less than twice width--- *pectinis* (Pesta)
7. Margins of fifth leg roughly parallel----- 8
 Free segment of fifth leg expanded basally----- 9
8. Ventral surface of last abdominal somite with a pair of rows of long slender spinules----- *columbiae* (Thompson)
 No ornamentation on last abdominal somite----- *rostratus* (Canu)
9. Lateral margin of terminal segment of fourth endopodite bearing 2 spinous processes----- *tivelae*, new species
 Lateral margin of this segment without processes----- *saxidomi*, new species
10. Second segment of fourth endopodite with a single seta----- 11
 Second segment of fourth endopodite bears 2 setae on medial surface.
anemoniae Claus
11. Terminal segment of fourth endopodite with 3 spines--- *panopeae*, new species
 Terminal segment of fourth endopodite with 2 spines and a ciliated seta.
nasutum (Edwards)
12. Length of caudal rami twice width----- *robustus* (Thompson and Scott)
 Length of caudal rami at least 4 times width.
serendibicus (Thompson and Scott)
13. Terminal antennal segment longer than penultimate segment----- 14
 Terminal antennal segment much smaller than penultimate.
prehensilis (Sars)
14. Third antennal segment bearing only setae----- 15
 Third antennal segment with a heavy spine on the distal ectal corner.
propinquus Nicholls
15. Length of caudal rami 4 times width----- *finmarchicus* (Scott)
 Length of caudal rami 10 times width----- *tenuicaudis* (Sars)

PARANTHESSIUS ANEMONIAE Claus, 1889

Paranthessius anemoniae CLAUD, 1889, p. 343, figs. 8-15 (Trieste; host: *Anemonia* sp.).—CANU, 1894, p. 137 (Îles Chausey, France); 1898, pp. 413-415, pl. 10.—ZULUETA, 1912, p. 12.—MONOD and DOLLFUS, 1932, pp. 143, 145-146.

PARANTHESSIUS CYNTHIAE (Brian, 1924)

Herrmannella cynthiac BRIAN, 1924, pp. 5-7, figs. 1-4 (Mauritania; host: *Cynthia* sp.).

PARANTHESSIUS FINMARCHICUS (T. Scott, 1903)

Herrmannella finmarchica T. SCOTT, 1903, pp. 28-30, pl. 4, figs. 14-19 (Bog Fjord, Finmark).

Herrmannella finmarchica SARS, 1918, pp. 179-180, pl. 101 (west and south coasts of Norway).

PARANTHESSIUS NASUTUM (Edwards, 1891)

Diogenidium nasutum EDWARDS, 1891, pp. 89-93, pl. 4, figs. 12-19 (Bahama Islands; host: *Mülleria agassizii* Selenka).

PARANTHESSIUS PARVUS (Norman and Scott, 1905)

Herrmannella parva NORMAN and SCOTT, 1905, pp. 299-300 (Plymouth Sound, England; "among Hydrozoa, etc., near low-water").

Herrmannella parva NORMAN and SCOTT, 1906, p. 199, pl. 13, fig. 15, pl. 15, figs. 7-10, pl. 16, fig. 12, pl. 19, fig. 5.—SARS, 1918, pp. 176-177, pl. 99 (west and south coasts of Norway; free-swimming at moderate depths).

PARANTHESSIUS PECTINIS (Pesta, 1909)

Pseudolichomolgus pectinis PESTA, 1909, pp. 263-265, pl. 2, figs. 8-10, pl. 3, figs. 11-16 (Barcola Canal, near Trieste; host: *Pecten glaber* [Linnaeus]).—PELSENEER, 1929, pp. 35, 44.

Paranthessius pectinis MONOD and DOLFFUS, 1932, pp. 148, 194.

PARANTHESSIUS PREHENSILIS (Sars, 1918)

Herrmannella prchensilis SARS, 1918, p. 178, pl. 109 (Skjerjehavn, outside Sogn Fjord, Norway; free-swimming, about 20 fathoms depth).

PARANTHESSIUS PROPINQUUS Nicholls, 1944

Paranthessius propinquus NICHOLLS, 1944, pp. 53-54, figs. 23-24 (Sellick Reef, South Australia).

PARANTHESSIUS ROBUSTUS (Thompson and Scott, 1903)

Herrmannella robusta THOMPSON and SCOTT, 1903, p. 282, pl. 17, figs. 1-8 (Gulf of Manaar, Ceylon; from washings of invertebrates).

PARANTHESSIUS ROSTRATUS (Canu, 1891)

Herrmannella rostrata CANU, 1891, p. 480 (sand banks, Pointe aux Oies, Wimereux, France; host: *Mactra stultorum*).

Herrmannella rostrata CANU, 1891, p. 436 (Étaples, France; host: *Pecten opercularis* Linnaeus).

Herrmannella rostrata CANU, 1892, pp. 236-237, pl. 24, figs. 1-13 (Baie d'Authie, France; host: *Cardium edule* Linnaeus).

Lichomolgus agilis T. SCOTT (not Leydig), 1892, pp. 266-267 (Morecambe Bay, England; Firth of Forth; host: *Cardium edule* Linnaeus).—T. and A. SCOTT, 1892, pp. 201-203, pl. 15, figs. 1-14.—HERDMAN, 1893, p. 83 (Liverpool Bay); 1893, p. 135.—THOMPSON, 1893, pp. 177, 207-208, pl. 25, figs. 4, 8d.

Herrmannella rostrata CANU, 1894, pp. 3, 10.

Herrmannella rostrata T. SCOTT, 1894, p. 259.—CANU, 1899, p. 73.—T. SCOTT, 1906, p. 354.

Herrmannella rostrata SARS, 1918, pp. 175, 180.

- Herrmannella rostrata* PELSENER, 1929, p. 43.—FRASER, 1932, p. 279 (Morecambe Bay; nettings of plankton over beds of *Cardium edule* Linnaeus).
Parantheissius rostratus MONOD and DOLLÉUS, 1932, pp. 147-148, 194-195.—ATKINS, 1934, p. 674 (Plymouth).—LEIGH-SILARPE, 1935, pp. 47-48 (Plymouth; hosts: *Cardium edule* Linnaeus, *Chlamys opercularis* [Linnaeus], *Paphia pullastra* [Montagu]).

PARANTHESSIUS SERENDIBICUS (Thompson and Scott, 1903)

- Herrmannella serendibica* THOMPSON and SCOTT, 1903, pp. 282-283, pl. 17, figs. 9-11 (Gulf of Manaar, Ceylon; washings of sponges).

PARANTHESSIUS TENUICAUDIS (Sars, 1918)

- Herrmannella tenuicaudis* SARS, 1918, pp. 180-181, pl. 102 (west coast of Norway).

PARANTHESSIUS VALIDUS (Sars, 1918)

- Herrmannella valida* SARS, 1918, pp. 175-176, pl. 98 (Stavanger Fjord, Norway; among dredged material from about 50 fathoms).

PARANTHESSIUS COLUMBIAE (Thompson, 1897)

FIGURES 33, 34

- Pseudolichomolgus columbiae* THOMPSON, in Herdman, Thompson, and Scott, 1897, pp. 87-88, pl. 8, figs. 1-10 (Puget Sound; plankton).

Specimens examined.—One lot of specimens from several examples of *Schizothaerus nuttallii* (Conrad), collected at Tomales Bay, Marin County, Calif., May 23, 1943, by P. L. Illg. Eleven adult females, 6 adult males, 50 immature specimens. (Selected specimens constitute U. S. N. M. No. 85348.)

Washings (formalin in sea water) of the red algal tuft on the siphon plates of an example of *Schizothaerus nuttallii* (Conrad), Tomales Bay, Marin County, Calif., May 23, 1943, P. L. Illg. One male of the fifth copepodid stadium. The alga was collected during the period of outgoing tide and was awash in several inches of water.

From one specimen of several examples of *Protothaca tenerrima* (Carpenter), Tomales Bay, Marin County, Calif., May 23, 1943, P. L. Illg, collector. Two adult females.

From several examples of *Schizothaerus nuttallii* (Conrad), Bodega Lagoon, Sonoma County, Calif., January 23, 1944. Collector K. A. Hok. Six adult females, five adult males, three immature specimens.

It is probably significant that every adult specimen of *S. nuttallii* examined on both the recorded occasions yielded examples of the copepod.

Distribution.—Puget Sound; Tomales Bay and Bodega Bay, Calif.

Description.—FEMALE: The body is elongated and slender; the habit is unique among the members of the genus (fig. 33, A). The

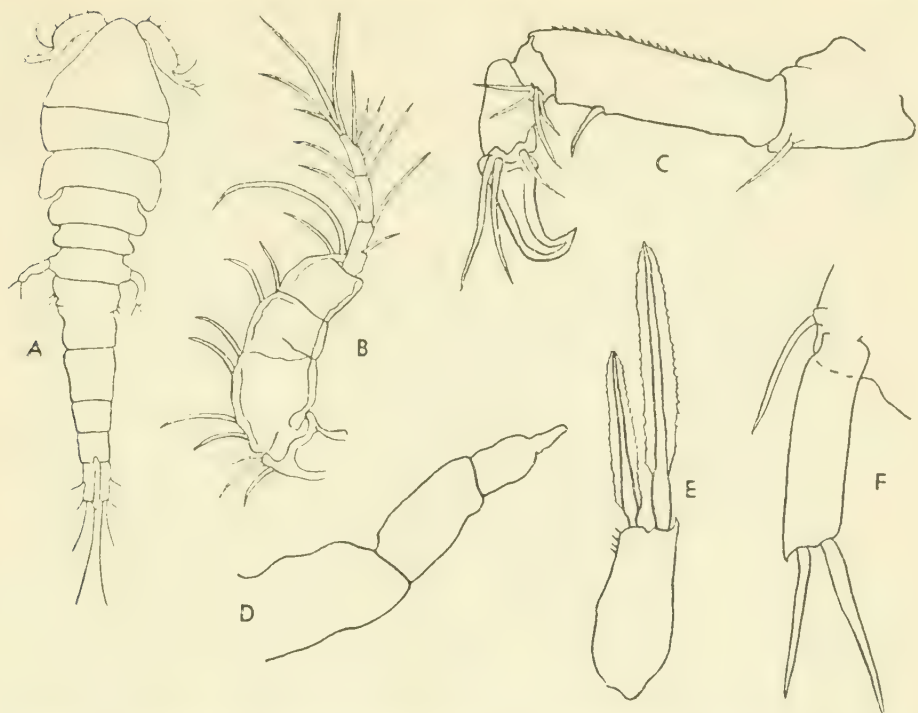


FIGURE 33.—*Paranthessius columbiae* (Thompson): FEMALE, A, body outline ($\times 28$); B, antennule ($\times 114$); C, antenna ($\times 240$); D, maxilliped ($\times 707$); E, terminal segment of fourth endopodite ($\times 240$); F, fifth leg ($\times 240$).

somite of the first swimming leg (the second thoracic somite) is separated from the cephalothorax and is the longest pedigerous segment. The articulation with the cephalothorax is very distinct both dorsally and ventrally. The legs are placed far back on the ventral side of the segment, and so the space between the mouth parts and the swimming legs is of considerable extent. The third thoracic segment is slightly shorter than the second and is the only metasome segment exhibiting posterior prolongation of its lateral margins. The fifth thoracic segment is the terminal segment of the metasome and is much the shortest and narrowest of these segments. The urosome is slightly longer than the metasome. It consists of the segment of the fifth legs, the genital segment and three free abdominal segments. The ovisacs are held closely appressed to the body and they extend slightly beyond the tips of the caudal rami. An estimate based on a typical ovisac would indicate as the usual contents approximately 120 small eggs.

The rostrum is highly characteristic. It is the well-developed prehensile organ typical of the genus, with the unique feature that the anterior, baselike structure of the beak is produced laterally in wide expansions, the extremes of which exhibit further ventral prolongation, so that the principal beak is accompanied by two auxiliary knobs

(fig. 34, A). A most curious feature of the sexual dimorphism of this species is the fact that in the males the auxiliary knobs are still more strongly produced as stout spines, directed ventrally and posteriorly, each equal to nearly half the length of the principal beak (fig. 34, F).

The antennule is unique among members of the genus so far described. The proximal four segments are intricately related in an

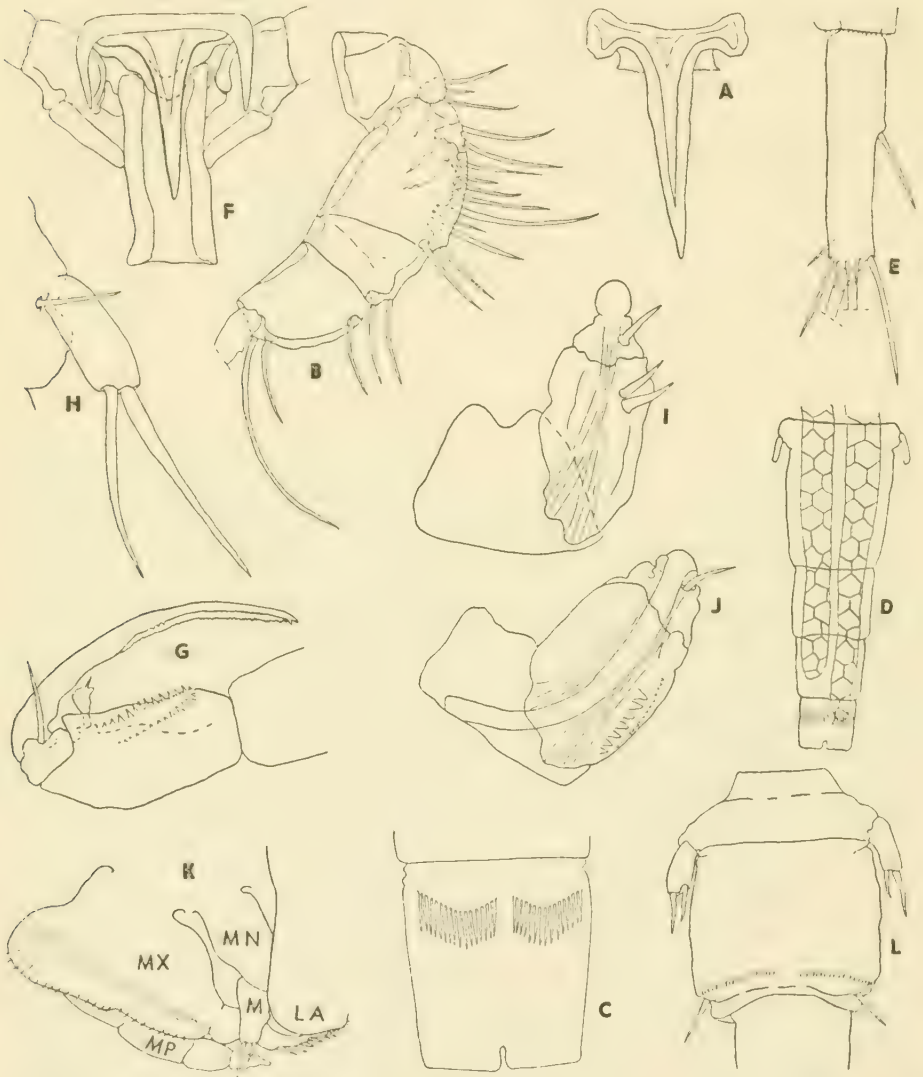


FIGURE 34.—*Paranthessius columbiae* (Thompson): FEMALE, A, rostral spine ($\times 144$); B, basal segments of antennule ($\times 296$); C, last abdominal segment ($\times 144$); D, abdomen ($\times 42$); E, caudal ramus ($\times 144$). MALE, F, rostrum and bases of antennules ($\times 144$); G, maxilliped ($\times 144$); H, fifth leg ($\times 424$). FIFTH COPEPODID, male, I, maxilliped of young example ($\times 296$); J, maxilliped of individual about to molt ($\times 296$). FOURTH COPEPODID, K, mouth parts ($\times 296$; LA, upper lip; MN, base of mandible; M, maxillule; MX, maxilla; MP, maxilliped); L, sixth and seventh thoracic somites ($\times 144$).

expanded, arched plate with highly chitinized margins (fig. 34, B). The distal three segments constitute a terminal whip, much narrower, more cylindrical, and with less departure from the usual lichomolgid structure (fig. 33, B). The first segment has a very mobile articulation with the second, which as usual is the longest segment of the antennule. The limit between the second and third segments is traceable by distinct but incomplete sutures, and a considerable partial fusion unites them. The articulation between the third and fourth segments is a complete one. The first segment bears four setae on the anterolateral corner. The second segment bears 13 setae arranged as a fairly dense row along the anterolateral margin. The third segment bears two setae on the distolateral corner. The fourth segment bears three setae on the anterolateral margin, one proximal, the others at the distal corner. The most distal of these is the longest seta of the antennule. The fifth segment, which is the longest of the distal trio, bears three setae. The sixth segment, just slightly shorter than the fifth, bears two setae. The short seventh segment bears four apical setae and four in a subapical position.

The antenna is 4-segmented. The second segment is much longer than the others and is somewhat flattened dorsoventrally, expanded mediolaterally. The heavy claw borne on the terminal segment is so oriented with the antenna that the dissected appendage takes a position which presents a deceptive narrowness of the second segment (fig. 33, C). The first and second segments each bear a single seta. The third segment bears four setae. The terminal segment, in addition to its large claw, has three setae, all placed at the base of the claw.

The mandible is the characteristic flat blade, tapering to a pointed flexible tip, with ciliate margins (as seen in the illustrated mandible of *Paranthessius tivelae*, fig. 36, I). The maxillule bears two terminally placed setae. Figure 34, K, presents the mouth parts of an immature individual in which there is complete correspondence to the adult female.

The maxilla is 2-segmented. The base is very large; its posterior margin bears a row of spinules. The terminal joint bears an unornamented proximal seta and a more distal, larger seta with cilia arranged along its posteromedial margin.

The maxilliped is very reduced, consisting of three simple segments, the terminal segment the shortest (fig. 33, D).

The swimming legs conform to the characteristic pattern for the genus. The arrangement of spines and setae on the segments of the rami follows:

First leg, exopodite: First segment (basal) bears a lateral spine; second segment bears a lateral spine and a medial seta; third segment (terminal) bears four spines and four setae. Endopodite: First seg-

ment—medial seta; second segment—medial seta; third segment—one spine and four setae.

Second leg, exopodite: First segment—lateral spine; second segment—lateral spine and medial seta; third segment—four spines and five setae. Endopodite: first segment—medial seta; second segment—two medial setae; third segment—three spines and three setae.

Third leg, exopodite: First segment—lateral spine; second segment—lateral spine, medial seta; third segment—four spines and five setae, Endopodite: first segment—medial seta; second segment—two medial setae; third segment—three spines and two setae.

Fourth leg, exopodite: First segment—lateral spine; second segment—lateral spine, medial seta; third segment—three spines and five setae. Endopodite: first segment—medial seta; second segment—medial seta; third segment—two terminal spines, the lateral about three-fifths of the length of the medial (fig. 33, E).

In all the pairs of swimming legs, the distal margins of the basipodites are set with very close-set, long, fine spinules which form a conspicuous fringe. The basis in each leg bears a small lateral seta just proximal to the articulation of the exopodite with the basis. The coxa bears a large ciliated seta at its medial distal corner. The margins of the rami are ciliated to varying degrees.

The fifth leg possesses a very elongate free segment (length three or more times the width), which is directed somewhat posteriorly. A dorsal seta, set on the body somite proper, represents the basis of the fifth leg. The terminal armature of the free segment comprises a shorter, lateral setiform member and a slightly longer, much stouter, medial spine (fig. 33, F).

The urosome is elongate, exceeding slightly the metasome. The urosome comprises the sixth thoracic segment (which bears the fifth legs); the genital segment, a fused composite of the seventh thoracic segment and the first abdominal somite; and three free abdominal segments. In all these, the posterior margins are entire, lacking the spinous serrations characteristics of some other species. The terminal segment exhibits an unique form of ornamentation. About midway in length of the segment is placed across the ventral surface a pair of rows of slender, elongate spinules, in fringe arrangement. The rows do not meet at the midline, and they form arches across the ventral surface nearly to its lateral extent. The number of spinules per row in specimens examined has varied from approximately 15 to 20 in each row (fig. 34, C).

Perhaps a significant anticipation of the encroachment of the whole body by reproductive structures in the most degenerate parasitic copepods is provided in this species where the ovarian (or oviducal) tubes of the two sides of the body extend into the abdomen, on one side, at least, usually penetrating the terminal segment (fig. 34, D).

The state of preservation of my specimens is not favorable for determining details of internal anatomy, so the exact identity of the oviferous bands has not been established. The typical position of the ovaries and oviducts in lichomolgids is in the thoracic segments, with no extension posterior to the apertures of the oviducts on the genital segment.

The caudal rami are about four times as long as wide (fig. 34, E). The proximal lateral seta is placed relatively far posteriorly, at about two-fifths the length of the ramus. The external seta is longer than the internal. The two longest central setae of the tip of the ramus are jointed at their bases; the longer is about two and one-half times the length of the caudal ramus.

Length of the body, exclusive of the setae of the caudal rami, is 2 mm.

MALE: The body habit retains the tendency to elongation of the female, but not in such extreme form; there is therefore little departure from the facies of the typical lichomolgid male. The segmentation of the metasome is the same in the two sexes. In the urosome, the genital thoracic segment of the male is a free somite and bears well-developed sixth legs. The separation of the first abdominal somite from the genital segment results in a urosome of six segments. The more extreme development of the rostrum of the male in comparison to the condition in the female has been described above (fig. 34, F). The antennule is alike in the two sexes.

The antenna bears out a tendency in the dimorphism of the species of *Paranthessius* I have seen toward an increase in number and size of spinous protuberances of the appendages. The second segment of the male antennule bears a row of spinules which are much stouter and longer than those seen in the female. The mandibles, maxillules, and maxillae do not exhibit dimorphism.

The maxilliped is one of the diagnostic structures of the male (fig. 34, G). The appendage is the largest and most conspicuous of the mouth parts. Of the three segments, the basal one is the shortest. The second segment is stout and long, its length about double the width. The terminal segment is parallel with and appressed to the second segment and, by a complicated articulation, forms a subchelate appendage with that segment. The terminal segment is a long narrow blade, about one and one-half times the length of the second segment. A seta, of curiously modified character, is borne on the second segment. A long seta is borne on the basal portion of the terminal segment. Stout spinules, set in rows, ornament the medial surface of the second joint.

In the swimming legs the sex of adults might be determined by the more spinous ornamentation of the limbs of the males. The fringes

of the basipodites are of heavier, more spinulelike members, particularly in the first three legs. The fourth pair is more like that of the female. A further feature of the first three legs is the prolongation of the distal medial corner of the second segment of the endopodite into a long, stout spinous process. This is not a true spine, as it lacks an articulation at the base and is therefore a direct extension of the integument of the podomere proper. These spinous processes are equivalent in size to the true, articulated spines, however. The contrast between these structures in the male and female is illustrated (fig. 36, C, F) for *Paranthessius panopeae*, the species in which the dimorphism is seen most strikingly. In the original description of *Pseudolichomolgus pectinis* Pesta, the illustrations show spines on the two proximal segments of all the endopodites. If these were movable spines, this would represent an unique condition among lichomolgids. The illustrations do show a somewhat subtle differentiation of these outgrowths from the truly articulated spines in the usual positions, and I suggest that they be interpreted as spinous processes comparable to those seen in the males described here.

The male fifth leg is reduced, much shorter in proportion to width than in the female, and the outgrowths are less robust, more setiform (fig. 34, H). The lateral seta is longer than the medial.

The seventh thoracic segment of the male is much modified because of a pair of chambers containing the sperm masses. The ventral portion of the segment is prolonged posteriorly on each side, and at the lateral limit of this prolongation is the slight prominence bearing two setae that constitutes the sixth leg. The posterior border of the prolonged region is further ornamented by spinules set in row formation parallel to the margin. In the present species there are two such rows of spinules on each side, parallel to each other, the count of spinules for one side being 24 in the anterior row, 16 in the posterior row. Figure 35, G, shows the arrangement of this segment and leg for *Paranthessius panopeae*.

The terminal abdominal segment bears the rows of spinules characteristic of the species in both sexes, and there is no notable dimorphism of the caudal rami. The body length is about 1.7 mm.

IMMATURE FORMS: The several specimens available of late developmental stages at first presented a puzzling complex of resemblances and differences. As will be presented in detail below, sufficient features were established to conclude that a portion of these represented the females and males of the final larval stadium (the fifth copepodid) and the remainder were of the fourth copepodid stage, in which no basis for differentiation of the sexes was discovered in the small sample considered.

Fifth copepodid. Female: The rostrum is very conspicuously developed in the 3-pronged pattern of the adult male. The lateral spines are equal to two-thirds of the length of the central beak. The appendages of the head all are identical with the adult condition. The thoracic appendages of the metasome are all identical with those of the adult. The small maxilliped establishes the specimen as a female, since the adult condition of the swimming legs is taken to be conclusive indication that this stadium is the ultimate larval copepodid.

In the urosome the characters depart from those of the adult. The fifth leg, however, approaches closely to the adult condition, although it is perhaps slightly less elongate. It is, in actual measurement, at least twice the bulk of the fifth leg of the adult male. Further, the terminal armature presents the stout medial spine, longer than the lateral seta. In the male, both adult and of this stadium, the longer member of these outgrowths is the lateral, and neither attains spinelike dimensions.

The urosome is 5-jointed, but it represents different segments from those present in the adult urosome of the same number of somites. The first segment is the sixth thoracic somite, bearing the fifth legs. The second segment is the seventh thoracic somite; it is thus established by the presence at its posterior margin of a spinule row and one seta, comparing incompletely but satisfactorily to the sixth leg armature of the adult male. The adult male, and also that of the fifth copepodid stadium, show two setae for this member. In this subadult female, the spinule row is but a single set of about 20 spinules on each side as compared to the pair of double rows of the corresponding male.

Three abdominal somites complete the urosome. Of these, the terminal one is the longest. This segment bears the characteristic pair of rows of spinules, exhibiting but eleven spinules on either side in the specimen examined. The proportion of length of segments is significant as it indicates clearly the rearrangement of segmentation of the urosome that takes place during the final molt. The result of this molt is a urosome in which the terminal thoracic segment and the first abdominal somite are fused into the very long genital segment. In this modification, all the ornamentation of the sixth leg disappears (except perhaps a reduced seta or two very inconspicuously placed at the openings of the oviducts). In the adult, the most proximal of the three abdominal segments is the longest, and this fact indicates that the terminal segment of the fifth copepodid is subdivided in the final molt.

The caudal rami of the fifth copepodid are stubbier than those of the adult. The proportion of length to width is about 3.3. The length of the body measures 1.4 mm.

Fifth copepodid. Male: The subadult condition of this male is patent in the 5-segmented urosome, which conforms in proportion and arrangement exactly to that of the female of the same stadium.

The fifth leg is comparable to that of the adult male. The longer of the terminal setae is lateral. The structures of the seventh thoracic somite are the two setae of the sixth leg and two pairs of rows of spinules, as in the adult.

The metasome of the subadult male exhibits some diagnostic features. The maxillipeds, while they are by far the most developed of the mouth parts, lack the free, subcheliform terminal segment of the adult. Two such maxillipeds (fig. 34, I, J) show the sequence of development of this appendage at an early stage and a later period within the same stadium. In the early copepodid of stage five, there is no indication of the elongate terminal claw (fig. 34, I). A globose end segment is the forerunner of the claw, however, as is seen in the second example where, under the cuticle, can be made out the features of the adult condition, about to be uncovered by the imminent final molt.

In the swimming legs the spinous processes of the distal medial corners of the second endopodite segments to be seen in the adult are here lacking. The segmentation of the rami and the complement of spines and setae are identical with those of the adult.

Length, exclusive of setae of the caudal rami, is about 1.4 mm.

Fourth copepodid. The metasome has the degree of segmentation seen in the adult. The rostrum shows very great development of the lateral spines, these being equal to more than three-fourths of the length of the central beak. The antennules, antennae, and mouth parts are as in the adult female. Figure 34, K, shows the arrangement of the mouth parts, the very large basal segment of the maxilla nearly obscuring the much reduced maxillipeds.

The swimming legs are 2-jointed and the complement of spines and setae of the adult is not attained, as the following representation of the armature of these appendages demonstrates:

First leg, exopodite: First segment—lateral spine; second segment—four spines, four setae. Endopodite: first segment—medial seta; second segment—one spine, six setae.

Second leg, exopodite: First segment—lateral spine; second segment—four spines, five setae. Endopodite: first segment—medial seta; second segment—three spines, five setae.

Third leg, exopodite: First segment—lateral spine; second segment—four spines, five setae. Endopodite: first segment—medial seta; second segment—three spines, three setae.

Fourth leg, exopodite: First segment—lateral spine; second segment—four spines, five setae. Endopodite: first segment—medial seta; second segment—two spines, one seta.

It will be noted that, while the full armature of the adult limb is not present in this larval state, there are included in the complement of the terminal segment spines or setae which finally appear, in the adult stadium, on the second segment.

The urosome is 4-segmented, composed of the sixth and seventh thoracic segments and two abdominal somites. Of these latter, the terminal segment is the longer. The fifth legs are short, the length equalling about one and one-half times the width. Of the terminal setae, the lateral is much the longer. The sixth leg is represented by a single seta. The single pair of spinule rows of the seventh thoracic segment comprise about twenty spinules on each side (fig. 34, L).

The caudal rami are relatively short and wide; the ratio of length to width is about 2.6. Total body length, exclusive of setae of caudal rami, is about 0.9 mm. No characters for differentiation of the sexes were found.

Remarks.—The single specimen upon which this species was founded was taken swimming in the plankton in the Puget Sound region. It was diagnosed as a male in the original description, with, however, one lapse where it was referred to as female in the legend for the illustrations (p. 90). The character that convinced the describer of the generic distinctness of the species was the 2-segmented rami of the swimming legs. This feature, together with the spine shown on the genital segment and the general configuration of the rostrum in the figures of the type, I find ample evidence to identify Thompson's specimen with the fourth copepodid developmental stage, as borne out by the series of specimens available to me which I consider to represent the same species. Additional information from my series serves to explain some other apparently anomalous features of Thompson's description.

The following are the characters in which Thompson's description and figures agree with my specimens:

The rostrum and antennules are alike in these two instances and are unique for the genus *Paranthessius*. The antennae, mandibles, maxillules, and the terminal portions of the maxillae correspond reasonably well. The maxilliped described by Thompson and illustrated as his figure 8 resembles no such structure known among the lichomolgids. However, reference to the mouth parts figured here as figure 34, K, may serve to explain this appendage. The base of the maxilla, with its very obvious muscle band, if the terminal portion were torn away and the line of this disruption misinterpreted as part of the natural boundary, might very well be delineated in exactly the appearance of Thompson's figure. Also, the maxillipeds are so inconspicuous and so overshadowed by these enlarged maxillae that it would be very easy to overlook them in a single dissection.

The first and fourth swimming legs are figured by Thompson and, in segmentation and arrangement of ornamentation, conform exactly to my description above.

The fifth feet present a discrepancy, Thompson's figure depicting a longer medial terminal seta. Whether great pains were taken to depict this feature exactly in an illustration (Thompson, fig. 1) obviously designed to present the body habit of the copepod rather than details of its anatomy might be subject to question.

Three abdominal segments are shown in Thompson's illustration (fig. 1), with a row of spines depicted along the boundary of the second and third segments. I suggest that the spinules present on the undivided terminal segment in my specimens could be readily so misinterpreted in casual observation. The seta of the sixth leg corresponds in the two instances.

The length (1.98 mm.) given by Thompson is greatly at variance with my specimens. He does not state whether the caudal setae are included in the measurement, but these structures are much less than half the body length in extent and could not account for the discrepancy seen. It may be that Thompson studied a specimen of a species different from my examples, but there are so many points by which I can reconcile these with his description that I do not deem it advisable to add a new name for representatives of this genus.

The specimens I have examined, including ovigerous females, adult males, and immature stages were taken as commensals or parasites upon the gills of clams. I have specimens collected from the mudflats near the mouth of Tomales Bay, Marin County, Calif., and additional examples from the similar situation nearby, Bodega Bay, Sonoma County, Calif. Further information as to the extent of occurrence of the copepod and the seasonal fluctuation of incidence and abundance would be of considerable interest. The thorough work of MacGinitie (1935) on the population of Elkhorn Slough, Monterey County, Calif., did not discover the presence of *Paranthesius columbiae*, although the abundantly occurring principal host was sufficiently scrutinized to bring forth numerous records of the encysted larvae of tapeworms. Even so inconspicuous a copepod could not have eluded such search. From observation of the living animals *in situ* upon the host, I can attest the great transparency and nearly complete invisibility of this copepod. Even under close scrutiny of the gills of the mollusk no more than a minute dark thread of about a millimeter or two in length betrays the parasite. This thread is the gut, which has a heavy wall. Whether the dark color is pigmentation of the wall itself or a property of the contents of the gut, I did not determine upon living copepods, and in preserved specimens the coloration rapidly disappeared.

The occurrence of Thompson's specimen in the plankton is not difficult of explanation. It is a frequent phenomenon for lichomolgids

to leave the host for varying periods, and numerous species have been described that have never been taken in association with another organism. Several records of *Paranthessius rostratus* are derived from collections of plankton from waters above cockle beds where the mollusks are infested by this species. In the case of *Paranthessius columbiae* I have recovered a male individual of the fifth copepodid stadium from washings of the red alga, which almost invariably occurs as dense tufts on the heavy siphon plates of *Schizothaerus nuttallii* of Tomales Bay. The amount of migration of the adults and the relative wanderings of the larval stages would be interesting details to supply in a complete biological investigation of this copepod. Large scale surveys of the mollusk fauna of a given locality should provide information of great interest in regard to the limits of specific infestation of given hosts.

PARANTHESSIUS PANOPEAE, new species

FIGURES 35, 36

Specimens examined.—Fourteen adult females, nine adult males, one female of the fifth copepodid stadium, from a single specimen of *Panope generosa* Gould, collected in Tomales Bay, Marin County, Calif., May 23, 1943, P. L. Illg, collector.

Types have been assigned the following United States National Museum catalog numbers: Holotypic female, 85343; allotypic male, 85344.

Description.—**FEMALE**: The body is elongated although not so extremely as in *P. columbiae*. The metasome consists of five somites. The cephalothorax is the longest segment. The relative lengths of the succeeding somites are in the order of their arrangement, as are also their relative widths. The somite of the first swimming legs is the widest somite of the metasome (fig. 35, A).

The urosome is 5-segmented, consisting of the sixth thoracic somite, the genital somite, and three free abdominal segments. The ovisacs are narrow, closely appressed to the abdomen, and elongate, reaching to the ends of the caudal rami. The eggs are small; a single ovisac contains a hundred or more eggs.

The rostrum is a long, pointed beak, directed posteriorly. It is movable, and the supporting structures on the head are associated with the bases of the antennules and antennae. There are no lateral auxiliary projections (fig. 36, A).

The antennule (fig. 36, A) is long and slender; it comprises seven segments. The second segment is the longest. The setal armature is as follows: First segment—four setae; second segment—nine setae; third segment—four setae; fourth segment—three setae; fifth seg-

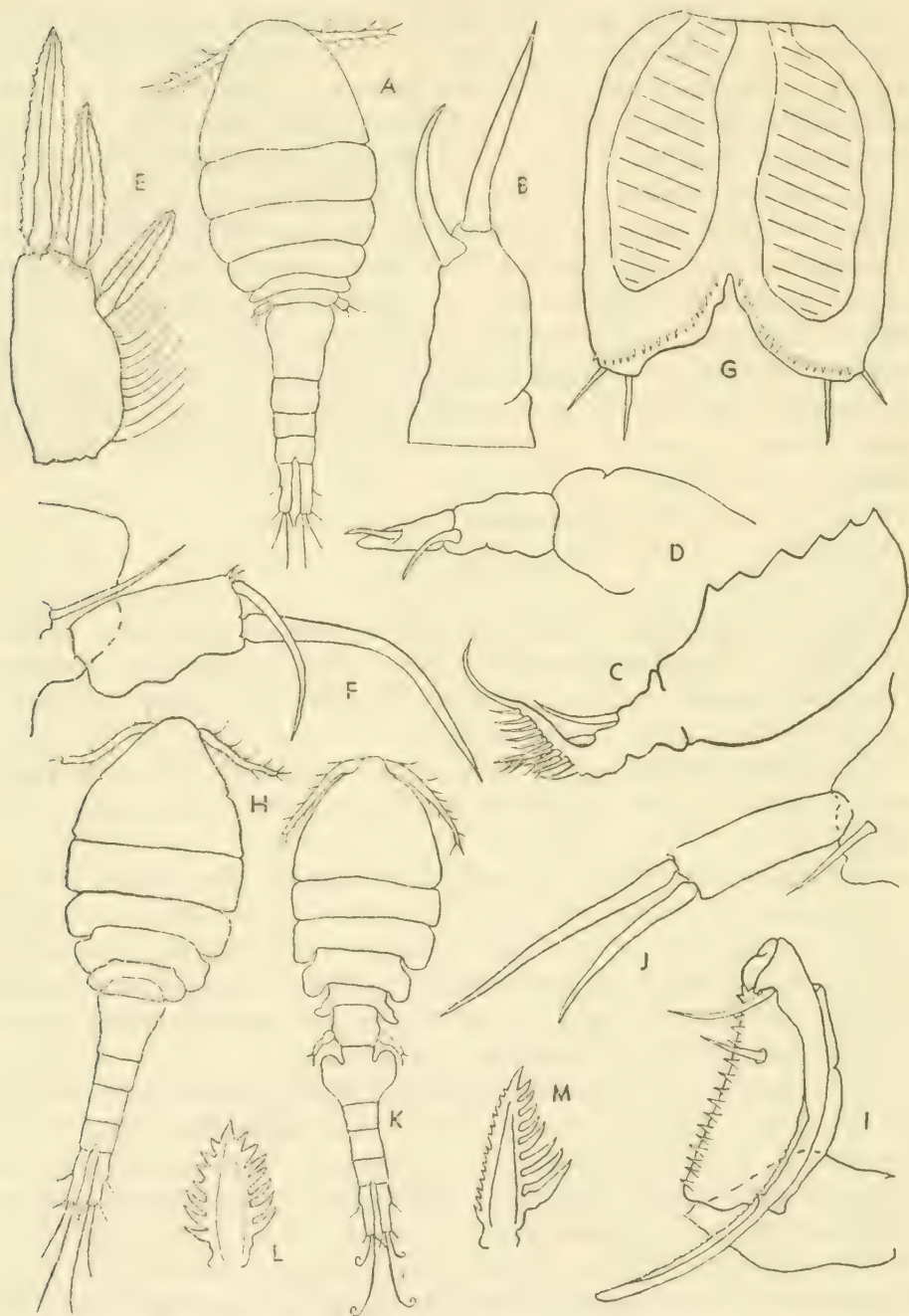


FIGURE 35.—A-G, *Paranthessius panopeae*, new species: FEMALE, A, body outline ($\times 28$); B, maxillule ($\times 707$); C, maxilla ($\times 240$); D, maxilliped ($\times 240$); E, terminal segment of fourth endopodite ($\times 493$); F, fifth leg ($\times 493$). MALE, G, seventh thoracic somite ($\times 167$). H-J, *P. tielae*, new species: FEMALE, H, body outline ($\times 45$). MALE, I, maxilliped ($\times 240$); J, fifth leg ($\times 707$). K-M, *P. perplexus*, new species: FEMALE, K, body outline ($\times 43$); L, spine of basal segment of first exopodite ($\times 424$); M, spine of second segment of first exopodite ($\times 424$).



FIGURE 36.—A-G, *Parantnessius panopeae*, new species: FEMALE, A, rostrum and antennule ($\times 100$); B, antenna ($\times 144$); C, first leg ($\times 296$); D, caudal ramus ($\times 296$). MALE, E, maxilliped ($\times 144$); F, first leg ($\times 296$); G, fifth leg ($\times 424$). H-M, *P. tielae*, new species: FEMALE, H, last abdominal somite and caudal ramus ($\times 144$); I, mandible ($\times 424$); J, maxilla ($\times 424$); K, maxilliped ($\times 424$); L, terminal segment of fourth endopodite ($\times 296$); M, fifth leg ($\times 424$).

ment—four setae; sixth segment—three setae; seventh segment—eight setae.

The antenna is very stout, 4-segmented. The relations of its parts are better presented by figure than by description (fig. 36, B).

The mandible is like that of the other species described here. The maxillule is a single, flattened segment, bearing two stout, spiniform setae terminally (fig. 35, B). The maxilla does not depart from the

usual structure seen in the genus. The proportional size of the basal segment is much less than that seen in *P. columbiae*. There is no difference in the maxilla in the two sexes (fig. 35, C).

The maxilliped is 3-segmented. The terminal segment is distinctly tapering, ending in a rounded apex. Both second and third segments bear short setae (fig. 35, D).

The swimming legs are comparable in segmentation and ornamentation with the detailed formula presented for *P. columbiae* except for two distinctive features. The marginal fringe of the first and second basipodites comprises stout, conspicuous spinules rather than slender cilia (fig. 36, C). The terminal segment of the fourth endopodite possesses an armature of diagnostic significance. In addition to two terminal spines, of which the medial is the longer by about a third, there is a third spine, placed on the lateral margin of the segment. This spine is the shortest of the three, equal to about half the length of the longest. The longest spine exceeds the length of the segment (fig. 35, E).

The free segment of the fifth leg is much flattened and is widest at its base. Two slight convexities appear on the posterior (or medial) margin. The terminal stout spine is nearly twice the length of the more laterally placed seta (fig. 35, F).

The caudal rami are very elongate, the length equaling seven times the width (fig. 36, D). The proximal seta of the lateral margin is placed nearly halfway from the base of the ramus to its tip. The lateral distal seta is but little longer than the medial distal seta, but somewhat stouter. The two central setae of the tip of the ramus are jointed at the base; the longer slightly exceeds in length the caudal ramus.

The length of the body, excluding the setae of the caudal rami, is 2.1 mm.

MALE: The metasome is less elongated than in the female. The urosome is 6-segmented. The rostrum, antennule, antennae, and cephalic mouth parts are just as in the female. The maxillipeds are of the characteristic male subcheliform construction. The basal segment is very wide. The second segment is less than twice as long as wide. It bears a seta and a row of spines along the medial surface. The terminal segment is the usual slender arc, its length exceeding twice that of the second segment (fig. 36, E).

The first three pairs of swimming legs exhibit on the distal lateral corner of the second segment of the exopodite a great prolongation of the integument into a large spinous process, which is differentiated from a true spine by its lack of a joint or articulation with the main body of the podomere. On the first leg this process equals in dimension the articulated spine of the distal segment (fig. 36, F). On the

fourth endopodite, this tendency to the production of spinous processes is less extreme, the appropriate corner in this appendage being produced only into a short, thornlike denticle of small dimensions. Somewhat similar, small, thornlike denticles occur on the lateral margin of the distal segment of this ramus, one placed just proximal to the base of each of the two more proximal spines. A further slight deviation in this podomere from the female condition is seen in the relatively greater length and slenderness of its spines.

The usual dimorphism of the lichomolgid fifth leg is seen in this species. The free segment is shorter and narrower than that of the female (fig. 36, G). The terminal armature is strikingly different, the setae being subequal in proportions with the lateral one slightly the longer.

The ornamentation of the seventh thoracic segment is typical for the genus (fig. 35, G). The pair of rows of spinules exhibit about 18 spinules on each side. The armature of the sixth leg comprises two subequal setae. The caudal rami differ in no essential from those of the female. The total length of the body is about 1.8 mm.

IMMATURE STAGE: Female of the fifth copepodid stadium. A single specimen of this stage was available and it was not subjected to detailed study, as it presented the diagnostic features of the species, slightly modified by the characteristics of the developmental state, as has been described here in detail in the cases of *P. columbiae* and *P. tivelae*. The length of the specimen is 1.6 mm.

***PARANTHESSIUS TIVELAE*, new species**

FIGURES 35, 36

Specimens examined.—Nine adult females, one adult male, thirteen immature specimens obtained from a single specimen of *Tivela stultorum* (Mawe), collected at La Selva Beach, Monterey Bay, Monterey County, Calif., June 13, 1943, P. L. Illg.

Types have been assigned the following United States National Museum catalog numbers: Holotypic female, 85346; allotypic male, 85345.

Description.—**FEMALE:** The proportions of the metasome conform fairly closely to the oval configuration of the typical cyclopoid (fig. 35, H). The cephalothorax includes the segment of the maxillipeds; the somites of the four swimming legs comprise the remainder of the 5-segmented metasome. The lateral portions of the segments of the swimming legs are produced posteriorly as rounded lobes.

The urosome is of the usual five segments. Distinctive of the species are the coarsely serrate posterior margins of the abdominal segments, with the exception of the terminal segment. These serra-

tions comprise very long toothlike shreds of the integument, arranged roughly as alternate wide and narrow spinules (fig. 36, H).

The egg sacs are elongate in this species, reaching to the caudal rami. The eggs are large. Each ovisac contains about 30 eggs.

The rostrum and antennules conform very closely to the condition figured for *P. panopeae*. The terminal segments of the antennule exhibit a slight degree of specific differentiation, however; in *P. tivelae* the sixth segment is longer than the fifth; in *P. panopeae* the proportion is reversed.

The antenna conforms almost exactly in proportions to that of *P. columbiae*.

The mandible is a very generalized one, its gradual taper and very simplified ornamentation of marginal cilia suiting it to exemplification as the typical form of the appendage for the genus or even for the family (fig. 36, I). The maxillule differs only in subtle and insignificant particulars of outline from that already illustrated for *P. columbiae*. It is a simplified, flat, tapering plate with two terminal setae. The maxilla, like the mandible, may be considered as generalized in construction (fig. 36, J). The well-developed base does not show the extreme enlargement that characterizes this appendage in *P. columbiae*. In the present species, the length of the basal segment but little exceeds its width. The terminal segment differs from the other species in the present collection by the lack of ornamentation of the more distal of the setae on the anterior surface. In the other species there are fine spinules or cilia arranged along one or both margins of the seta. Such simple setae are found in this position in some other members of the genus. In all the species, the more proximal of the two setae of this segment is always without ornamentation.

The maxilliped is distinctive in *P. tivelae* (fig. 36, K). The articulation with the head is so complicated that it is impossible from my preparations to say with certainty whether the appendage is 2- or 3-segmented. The terminal segment is conical, with pronounced rounding of the tip. This segment bears two minute setae. The segment next proximal (basal segment?) is subquadrate, of very great width in proportion to its length.

The swimming legs are all by generic definition 3-jointed in both rami. The number and distribution of the spines and setae are exactly those presented above for *P. columbiae*. Characteristic minor features of these limbs for the species are the following, however: The basipodite of the first legs bears a marginal fringe of very stout spinules (as illustrated for the male of *P. panopeae*). On the bases of all the other legs, this fringe is comprised of well-developed cilia, much more slender and delicate in configuration than the robust spinules, although of about equal length. Very stoutly developed spinous proc-

esses of the integument are placed on the distal lateral corners of the middle segments of the endopodites of the first and second legs. These processes are nearly as highly developed as those described for the males of the other species of the present collection. In the third and fourth endopodites, there are thornlike, short, spinous projections in the corresponding position, but these do not show the prolongation into long outgrowths like those of the first two legs. The terminal segment of the fourth endopodite is an identifying structure in this species (fig. 36, L). The edges of the segment are nearly parallel. Two small thornlike processes (spinules or denticles) on the lateral margin are characteristic. The more proximal spinule is placed at a point two-thirds the length of the margin from the base of the segment. The distal spinule is at the base of the terminal spine.

The fifth leg bears a resemblance to that of *P. saxidomi* in the inflation of the posterior proximal margin of the free segment. However, the terminal spine of this species is twice the length of the segment (in *P. saxidomi* the spine is little more than one and one-half times the length of the segment). As in the other species, the spine is the more posterior outgrowth of the free segment. This spine of *P. tivelae*, further, exceeds the accompanying seta by one sixth of its own length (fig. 36, M).

The caudal rami are about five and one-half times as long as wide (fig. 36, H). The lateral proximal seta is inserted slightly short of half the distance from the base to the tip of the ramus. The most medial terminal seta is longer than the lateral apical seta. The two central setae of the four at the tip of the ramus are jointed at their bases. The longer of these two is about two and one-half times the length of the ramus. No seta of the caudal rami exhibits ciliation of its margins. The total length of the body, excluding the caudal setae, is 1.3 mm.

MALE: The shape of the body and the segmentation present the usual dimorphism characteristic of this group of copepods. The cephalic appendages correspond to those of the female. The basal segment of the prehensile maxilliped bears a weakly produced spinous projection at the posterior medial corner. The length of the second segment is roughly twice the width. A simple row of conspicuous spinules forms a border along the medial margin of the segment. The long claw comprising the terminal joint is twice the length of the second segment (fig. 35, I).

The swimming legs conform more closely to the female type than is usually the case in the other species in the present collection. There is an accentuation of the spinous nature of the marginal fringes of the basipodites and the spinous processes of the endopodites are somewhat longer and more robust.

The margins of the free segment of the fifth leg are parallel. Both terminal outgrowths are setiform; of these, the posterior is much the shorter (fig. 35, J). The sixth legs are represented only by two setae. The ornamentation of the last thoracic segment is a pair of rows of spinules, about thirty spinules comprising the row on either side. The heavily spinous serrations of the posterior margins of the abdominal somites are like those in the female. There is no feature of the caudal rami exhibiting any considerable dimorphism. The total length of the body, exclusive of the setae of the caudal rami, is about 1.1 mm.

IMMATURE STAGE: Female copepodid of the fifth stadium. The metasome presents no point of difference in its contours or its complement of appendages from the condition of the adult female, except its slightly smaller size. The urosome is very different from the adult condition. The five segments comprise the last two thoracic segments and three abdominal segments. Of these latter, the terminal segment is the longest. This proportion anticipates the final molt in which the first abdominal segment becomes fused to the last thoracic segment and a subdivision of the terminal somite restores the number of free abdominal segments to three. The two anterior abdominal segments present have the coarse serration of the posterior margins which is characteristic of the adults of the species. The caudal rami are not so long in proportion to width as is the case in the adult, but the general aspect of arrangement of the ornamentation shows no significant difference.

The fifth legs are just like those of the adult male. This is a strong contrast to the condition in *P. columbiae*, where in the fifth copepodid this appendage is recognizable as of the female type. The proportion of the length to width of the free segment of the fifth leg is about that seen in the male. The more posterior (medial) of the terminal setae is much shorter than the anterior (lateral) seta. The terminal thoracic segment bears a small seta at each posterior lateral corner of the ventral side, representing the reduced sixth leg. An additional ornamentation of the segment is a pair of rows of fine, short spinules extending across the ventral surface parallel with and close to the posterior ventral margin of the segment.

The total length of the body, exclusive of the caudal setae, is 1 mm.

PARANTHESSIUS SAXIDOMI, new species

FIGURE 37

Specimens examined.—Six adult females, three adult males, twenty-two copepodids of the fourth and fifth stadia obtained from several specimens of *Saxidomus nuttallii* Conrad, collected in Tomales Bay, Marin County, Calif., May 23, 1943, P. L. Illg.

Types have been assigned the following United States National Museum catalog numbers: Holotypic female, 85341; allotypic male, 85342.

Description.—**FEMALE:** The metasome is very wide in proportion to its length, presenting a suborbicular outline (fig. 37, A). The



FIGURE 37.—A-H, *Paranthessius saxidomi*, new species: FEMALE, A, body outline ($\times 25$); B, antenna ($\times 144$); C, maxilliped ($\times 684$); D, terminal segment of fourth endopodite ($\times 296$); E, fifth leg ($\times 296$); F, caudal ramus ($\times 144$). MALE, G, maxilliped ($\times 296$); H, fifth leg ($\times 684$). I-P, *P. perplexus*, new species: FEMALE, I, rostrum ($\times 296$); J, antennule ($\times 144$); K, antenna ($\times 144$); L, mandible ($\times 424$); M, maxilliped ($\times 296$); N, terminal segment of fourth endopodite ($\times 296$); O, fifth leg ($\times 296$); P, caudal ramus ($\times 144$).

greatest width is seen in the second segment of the metasome, which segment is that of the first swimming legs. The third metasome segment has the posterior lateral margins strongly produced caudad as rounded lobes. The urosome is 5-segmented, with no ornamentation of spinules. The metasome slightly exceeds the urosome in length.

The rostrum is distinctive in this species. At the anterior limit of the structure, there is great lateral expansion, equivalent to that seen in *P. columbiae*. There is here, however, no further production of the structure into auxiliary knobs or spines like those seen in the previously described form.

The antennules are of generalized structure, departing only in insignificant details from the appendage as described and figured above for *P. panopeae*. In the present species, there is a heavier chitini- zation of the anterior and posterior margins of the more proximal segments.

The distinction of the antenna from that of the species described above must be principally on subtle variations of the proportions of the component segments. A pronounced proximal constriction of the second segment produces a distinctive club-shaped contour (fig. 37, B).

The mouth parts resemble those in the species heretofore described. The most notable feature is the extreme reduction of the maxilliped. It retains the usual three segments (fig. 37, C), but the size is reduced so greatly that the sum of the lengths of the three segments is less than half the length of the basal segment of the maxilla. The basal segment is expanded and articulates with a complex set of very heavily chitinized ridges on the ventral surface of the head.

The rami of the swimming legs are all 3-segmented. The complement of spines and setae is exactly that presented in detail above for *P. columbiae*. The ornamentation of the terminal segment of the fourth endopodite is distinctive. The very long medial spine is nearly two and one-half times longer than the lateral spine (fig. 37, D). The basipodites of the first three pairs of swimming legs bear the usual marginal fringes, but they are composed in this species of exceptionally stout, numerous spinules. The fourth basipodite is fringed by sparsely distributed, short, fine cilia.

The outline of the fifth leg presents a rounded expansion at the base (fig. 37, E). The terminal outgrowths are relatively short, subequal, the more posterior (medial) stouter and more spinelike.

The caudal rami are of moderate length (fig. 37, F). The ratio of length to greatest width is about 3.5. The proximal lateral seta is articulated at a point well short of half the length of the ramus. The two elongate, central apical setae are jointed at their bases. The longer of the two is more than three times the length of the ramus. None of the setae of the caudal ramus is ciliated.

The total length of the body, exclusive of the terminal setae of the caudal rami, measures about 1.7 mm.

MALE: The metasome is not so inflated in outline as that of the female. The segmentation (five joints) is the same in the two sexes. As is usual, the urosome of the male is 6-segmented. The rostrum, antennules, and cephalic mouth parts are not distinctly different in the two sexes. The maxillipeds present the most conspicuous ornamentation among the species considered here (fig. 37, G). A large posteriorly and medially directed spinous process forms a prolongation of the basal segment. The second segment bears a modified seta, recalling that seen in *P. columbiae*. Unusually stout and numerous spinules ornament the medial margin of the second segment (several rows of small spinules on the ventral surface of that segment are not depicted in the illustration because of the confusion of detail that would result).

In the swimming legs there is the same development of spinous processes on the endopodites of the first three legs as in the preceding species.

The fifth leg is much reduced by comparison to the female structure. The basal portion of the free segment is constricted somewhat. No preparation was obtained which preserved both the terminal setae. That observed and figured (fig. 37, H) is the more posterior, and it is a fairly stout and notably shortened spinelike outgrowth.

The sixth legs are represented by the usual two setae. On the flaplike extension of the body somite are borne two pairs of rows of spinules (recalling *P. columbiac*). The more anterior row comprises about 22 spinules on each side, the posterior row about 15 spinules on each side.

The abdomen, except for its characteristically male segmentation, exhibits no other features differentiating it from that of the female. The total length of the body is 1.2 mm.

***PARANTHESSIUS PERPLEXUS*, new species**

FIGURES 35, 37

Specimens examined.—Two adult females, from gills of *Saxidomus nuttallii* Conrad, in association with numerous specimens of *P. saxidomi*. Collected at Tomales Bay, Marin County, Calif., May 23, 1943, P. L. Illg.

The holotypic female has been designated U. S. N. M. No. 85347.

Description.—**FEMALE:** The body configuration is distinctive (fig. 35, K). The 5-segmented metasome is not exceptional, its narrowly oval contour being of the generalized cyclopoid facies. The urosome is of the usual five segments. The contour of the genital segment is characteristic for the species. An ellipsoid process, with free rounded

anterior extremity, is extended laterally from each side, the lobes thus produced each nearly equaling in width the central portion of the segment. The width of the segment, by this lateral extension, considerably exceeds its length. The urosome is slightly shorter than the metasome. The margins of the abdominal somites are entire, exhibiting no denticulation or spinous serration.

The rostrum and associated structures are exceptional, unique in form among members of the genus that I have seen (fig. 37, I). The usual beaklike spine is absent; the front of the head is produced ventrally and somewhat posteriorly in a rounded lobe. The usual basal chitinous plate extending posteriorly between the bases of the antennules and antennae presents a remarkable modification. At a level just back of the bases of the antennules, this structure is produced ventrally as an elongate, terminally bifurcate projection. The aspect is of rather soft and flexible consistency of the thin chitinous integument. The usual chitinous bars of this region are represented posterior to this bilobed structure as a narrow bar, divergent posteriorly in the shape of an inverted Y.

The antennules are 7-segmented. The margins are rather irregular in outline and show no indication of the chitinous reinforcements seen in some of the species described above. The sixth and seventh segments are unusually short in proportion to their width. All the details of setal armature that could be made out on the two available specimens are presented in the accompanying figure (fig. 37, J).

The antennae are very stocky in general aspect by comparison with the other species described here. The length of the second segment is considerably less than twice the greatest width. In the other species seen the ratio of length to width of this segment is much greater than 2. In the details of ornamentation the appendage does not differ significantly from that of the other species (fig. 37, K).

The mandibles exhibit an expansion of the basal portion of the flat ciliated blade that approaches in appearance the mandible of some of the species of *Lichomolgus* (fig. 37, L). This contour is the only such instance among the members of *Paranthessius* that I have seen, but its significance can be hardly more than a verification of the rather close systematic relationship of the genera. The maxillule is like that of the other species described above. The maxilla is of generalized appearance, sufficiently resembling that of *P. tivclae* to require no separate illustration. However, in *P. perplexus* the more distal of the two setae of the terminal segment of the maxilla bears the usual fringe of fairly heavy cilia along its distal margin as in the remainder of the species treated here.

The maxilliped is developed to a degree remarkable among the members of the genus. Here it is the most conspicuous of the mouth parts, very considerably exceeding in its dimensions the maxilla, which is usually the most prominent oral appendage. The basal segment is long and is expanded basally in its complicated articulation with the surface of the head. The exact proximal limit of the appendage could not be made out. The second segment is the longest. It has rather irregular contours with a slight inflation of outline toward its center. A single minute seta is borne slightly distal to the center. The distal segment is a short cone bearing at its apex a small, articulated hook. It would be a matter of opinion to interpret the hook as a dactylar segment or, alternatively, as a process of the usual 3-jointed appendage (fig. 37, M).

The swimming legs have the same distribution of spines and setae as has been given above for *P. columbiae*. A most distinctive feature of the first legs is the modification of the more proximal spines of the exopodite. The spine of the first joint of this ramus is expanded and flattened in the plane of the appendage and both margins consist of rows of elongate, highly developed, secondary denticles (fig. 35, L). The spine of the second segment and the three more proximal spines of the terminal segment all exhibit the same flattening. In these spines, however, the pectinate denticles are restricted to the more proximal margin (fig. 35, M). The distal margins of these spines exhibit the coarsely serrated, almost transparent laminae that are seen on the spines of all the species of *Paranthessius* considered here.

The apical segment of the fourth endopodite bears terminally two subequal spines. The medial spine exceeds the lateral one by about one-sixth of its own length. Both spines are very stout (fig. 37, N).

The fifth leg is peculiar to the species. The free segment is inflated and larger basally than distally. At about one-third of the length of the segment from the base there is a pronounced constriction. Of the terminal outgrowths, the more anterior is the stouter and longer (fig. 37, O).

The abdominal somites exhibit no spinous ornamentation. The caudal rami are about six times as long as wide (fig. 37, P). The proximal lateral seta is inserted just midway on the lateral margin. Of the four terminal setae, the more lateral is longer than the medial seta. The two central setae are jointed basally. At the distal extremity these two setae tend to curl into loose spirals. The longest seta is about one and one-half times the length of the ramus. None of the setae bears ciliation. The length of the body, exclusive of the caudal setae, is 1.3 mm.

No male was found.

SUMMARY

The genus *Paranthessius* Claus, 1889, is reviewed and redefined to include species formerly assigned to *Diogenidium* Edwards, *Herrmannella* Canu, *Lichomolgus* Thorell (part), *Pseudolichomolgus* Thompson, *Pseudolichomolgus* Pesta, and *Pestalichomolgus* Wilson. A key to the 18 species is presented, with synonymies and a compilation of the published distribution.

Representatives of the genus have been found in semiparasitic or commensal association with a number of common clams of the Pacific coast. *Paranthessius columbiae* (Thompson) was taken from the gaper clam, *Schizothaerus nuttallii* (Conrad), and from *Protothaca tenerrima* (Carpenter).

New species are *Paranthessius panopcae*, from the geoduck, *Panope generosa* Gould; *P. tivelae* from the pismo clam, *Tivela stultorum* (Mawe); and *P. sawidomi* and *P. perplexus* from the Washington clam, *Sawidomus nuttallii* Conrad.

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MAMMALS OF NORTHERN COLOMBIA

PRELIMINARY REPORT NO. 5: BATS (CHIROPTERA)

By PHILIP HERSHKOVITZ

No OTHER order of mammals is represented in northern Colombia by such diversity of forms and abundance of individuals as the Chiroptera, or bats. A hypothetical list of all the bats of that part of Colombia comprising the departments of Magdalena, Atlántico, Bolívar, Norte de Santander, and the Comisaría de la Guajira (map, fig. 38) would enumerate at least 100 species. The list would necessarily include nearly every species that occurs in both North and South America, a number of West Indian bats, and many other Neotropical species not heretofore recorded from northern Colombia and Central America.

The first published account of bats from northern Colombia was presented in 1900, by Bangs. He recorded 10 species collected by W. W. Brown, Jr., in the Santa Marta region, department of Magdalena. A few months later J. A. Allen listed 22 species represented by about 175 specimens collected by H. H. Smith in the same area. Later, in 1904, in a formal report on all the mammals collected by Smith, Allen repeated the earlier list of bats and added four more species. This brought the total number of species known from the Santa Marta region to 30. Sanborn, in 1932, identified a collection of bats in the Carnegie Museum which included 16 species of bats from the departments of Magdalena, Bolívar, and Norte de Santander. Some of the Colombian specimens identified were duplicates of the original Smith collection, but the greater number was collected by

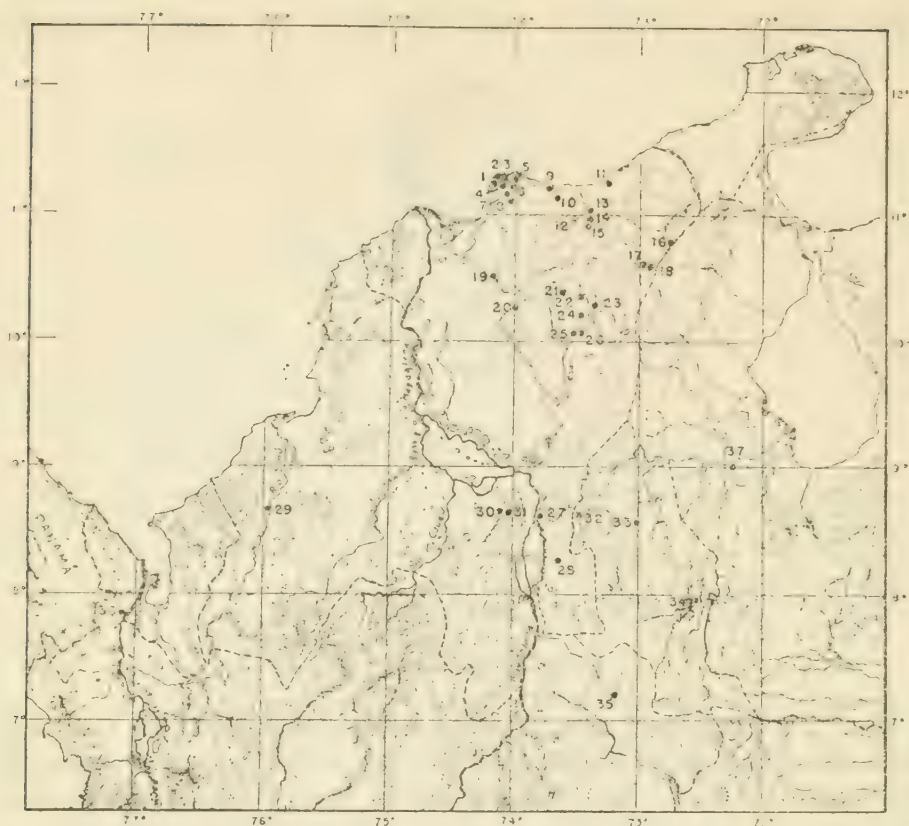


FIGURE 38.—Map of northern Colombia showing collecting localities of bats.

DEPARTMENT OF MAGDALENA:

Aguachica—28
 Aguas Blancas—24
 Bonda—3
 Cacagualito—5
 Colonia Agrícola de Caracolicito—20
 Dibulla—11
 Don Diego—9
 El Orinoco—26
 El Salado—22
 Fundación—19
 La Concepción—13
 La Gloria—27
 Las Marimondas—16
 Mamatoco—4
 Minca—7
 Onaca—6
 Palomino—10
 Pueblo Bello (Pueblo Viejo Sur)—21
 Pueblo Viejo—14
 Río Guaimaral—25
 San Antonio—15
 San Miguel—12

Santa Marta—1

Sierra Negra—18

Taganga (not "Taguaga" or "Tag-
 auga")—2

Valencia—23

Valparaiso (= Cincinnati)—8

Villanueva—17

DEPARTMENT OF BOLÍVAR

Jaraquiel—29

Norosí—31

Río San Pedro—30

DEPARTMENT OF NORTE DE SANTANDER

Cúcuta—34

Guamalito—32

Río Tarra—33

DEPARTMENT OF SANTANDER (extraterri-
 torial)

El Tambor (= El Tambo?)—35

INTENDENCIA DEL CHOCHÓ (extraterritorial)

Sautatá (not "Soatata")—36

STATE OF ZULIA, Venezuela (extraterri-
 torial)

Encontrados—37

M. A. Carriker, Jr. Sanborn's list included three species not previously recorded from northern Colombia. Subsequent publications on bats by Sanborn added four more species to the known bat fauna of the region, bringing the total of recorded species to 37. The bats collected in northern Colombia by the author during his tenure of the Walter Rathbone Bacon Traveling Scholarship consists of 33 species represented by 491 specimens, of which 172 are preserved in alcohol. Eight of the species are first records for the region. Bats have not yet been recorded from the department of Atlántico and from the Guajira, the northernmost part of Colombia. No doubt many species now known only from the Antilles will be found in the Guajira also.

The foregoing enumerates the 45 species of bats presently known from northern Colombia. In this paper only the specimens collected by the author are listed. Northern Colombian localities of bats recorded by other authors are given in the synonymies.

NOTES ON MEASUREMENTS

All measurements given in the text are in millimeters. Unless otherwise indicated the measurements are those of specimens collected by the author and preserved as dry skins with skulls separate. External measurements (except of the wing) are of bats in the flesh prior to skinning. Hind-foot measurements include claws; ear measurements are from the notch. Forearm and other wing measurements are from the dry skin. Measurements of specimens preserved in alcohol are given when the figures are greater or less than the extremes of the corresponding measurements of the dry skin or if they are the only ones available. Except where noted, measurements of individual specimens are given in the same order in which they are listed under the heading *Specimens collected*.

RHYNCHISCUS NASO Wied-Neuwied

Vespertilio naso WIED-NEUWIED, Reise nach Brasilien, vol. 1, p. 251, footnote, 1820.

Rhynchiscus naso, SANBORN, Publ. Field Mus. Nat. Hist., zool. ser., vol. 20, p. 325, 1937 (revision).

Type locality.—Banks of Rio Mucuri, near Morro d'Arara, Minas Gerais, Brazil.

Specimens collected.—Five. Colonia Agrícola de Caracolicito, 2 males, 3 females (2 in alcohol).

SACCOPTERYX BILINEATA Temminck

Urocryptus bilineatus TEMMINCK, in Van der Hoeven and Vriese, Tijdschr. Nat. Gesch. Physiol., Leiden, vol. 5, p. 33, 1938-39.

Saccopteryx bilineata, BANGS, Proc. New England Zool. Club, vol. 1, p. 101, 1900 (Santa Marta).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 93, 1900

(Bonda; Minca).—SANBORN, Ann. Carnegie Mus., vol. 21, p. 171, 1932 (Bonda; Mamatoco); Publ. Field Mus. Nat. Hist., zool. ser., vol. 20, p. 328, 1937 (Bonda; Santa Marta; Minca; revision).

Type locality.—Surinam.

Specimens collected.—Sixty-five. El Salado, eastern slope of Sierra Nevada de Santa Marta, 4 males (3 in alcohol), 3 females (1 in alcohol), 1 skeleton only; Río Guaimaral, 13 males (6 in alcohol), 12 females (9 in alcohol); Villanueva, 2 males (in alcohol), 9 females (6 in alcohol); Norosí, Bolívar, 9 males (4 in alcohol), 9 females (4 in alcohol); Guamalito, Norte de Santander, 1 male (in alcohol), 2 females (in alcohol).

SACCOPTERYX LEPTURA Schreber

Vespertilio lepturus SCHREBER, Die Säugethiere, vol. 1, p. 173 (description), pl. 57 (name), 1774.

Saccopteryx leptura, BANGS, Proc. New England Zool. Club, vol. 1, p. 101, 1900 (Santa Marta).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 94, 1900, part (Bonda).—SANBORN, Publ. Field Mus. Nat. Hist., zool. ser., vol. 20, p. 332, 1937 (Santa Marta Mountains; Bonda; revision).

Type locality.—Surinam.

Specimens collected.—Three. Villanueva, 1 male (in alcohol), 2 females.

SACCOPTERYX CANESCENS Thomas

Saccopteryx canescens THOMAS, Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 366, 1901.—SANBORN, Publ. Field Mus. Nat. Hist., zool. ser., vol. 20, p. 334, 1937 (Dibulla; Fundación; Mamatoco; Bonda; revision).

Saccopteryx leptura, ALLEN (*nec* Schreber), Bull. Amer. Mus. Nat. Hist., vol. 13, p. 94, 1900 (part; Bonda).—SANBORN, Ann. Carnegie Mus., vol. 21, p. 172, 1932 (Mamatoco; Fundación; Dibulla).

Type locality.—Obidos, Rio Amazonas, Pará, Brazil.

Specimens collected.—Thirteen. Villanueva, 2 males (in alcohol), 5 females (3 in alcohol); Río Guaimaral, 1 male (in alcohol), 1 female; El Orinoco, Río Cesar, 2 females; Norosí, Bolívar, 1 male (in alcohol), 1 female.

Measurements.—Forearm, 34.4–36.4 mm. in 4 males, 34.4–39.0 in 9 females.

PEROPTERYX MACROTIS MACROTIS Wagner

Emballonura macrotis WAGNER, Wiegmann's Arch. Naturg., Jahrg. 9, vol. 1, p. 367, 1843.

Peropteryx canina, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 93, 1900 (Bonda).

Peropteryx macrotis macrotis, SANBORN, Publ. Field Mus. Nat. Hist., zool. ser., vol. 20, p. 339, 1937 (Bonda; revision).

Type locality.—Matto Grosso, Brazil.

Specimens collected.—Twenty-seven. Villanueva, 13 males (8 in alcohol), 14 females (7 in alcohol).

CORMURA BREVIROSTRIS Wagner

Emballonura brevirostris WAGNER, Wiegmann's Arch. Naturg., Jahrg. 9, vol. 1, p. 367, 1843.

Cormura brevirostris, SANBORN, Ann. Carnegie Mus., vol. 21, p. 172, 1932 (Don Diego); Publ. Field Mus. Nat. Hist., zool. ser., vol. 20, p. 348, 1937 (Don Diego; revision).

Type locality.—Marabitanas, Rio Negro, Amazonas, Brazil.

NOCTILIO LEPORINUS LEPORINUS Linnaeus

Vespertilio leporinus LINNAEUS, Systema naturae, ed. 10, p. 32, 1758.

Type locality.—"America." Restricted to Surinam by Thomas (Proc. Zool. Soc. London, 1911, p. 131).

Specimens collected.—Two. Río Guaimaral, 1 male; El Orinoco, Río Cesar, 1 female.

Measurements.—Head and body, 90, 99; tail, 31, 26; hind foot, 36, 34; ear, 30, 30; forearm, 85.0, 84.7; greatest length of skull, 26.8, 25.4; condylobasal length, 24.8, 23.9; zygomatic breadth, 18.9, 18.5; width of brain case, 13.9, 13.2; interorbital constriction, 7.0, 6.9; distance across canines at cingula, 8.9, 8.2; maxillary tooth row, 10.5, 10.3; length of mandible (to front of canine), 19.2, 18.2.

Remarks.—The female is browner on dorsal surface than the male.

NOCTILIO LABIALIS MINOR Osgood

Noctilio minor OSGOOD, Publ. Field Mus. Nat. Hist., zool. ser., vol. 10, p. 30, 1910.

Type locality.—Encontrados, south of Lake Maracaibo, Zulia, Venezuela.

Specimens collected.—Six. Río Guaimaral, 1 subadult female; La Gloria, Río Magdalena, 5 females (3 in alcohol).

Measurements.—Head and body, 57, 58, 54; tail, 19, 19, 18; hind foot, 16, 15, 17; ear, 24, 24, 24; forearm, 59.0, 58.9, 56.3 (of the specimens in alcohol, 56.9, 59.7, 61.2); greatest length of skull, 18.4, 20.2, 20.2; condylobasal length, 17.2, 18.5, 18.3; zygomatic breadth, 13.2, 14.6, 14.3; width of brain case, 10.0, 10.6, 10.7; interorbital constriction, 5.2, 5.6, 5.7; distance across canines at cingula, 5.3, 6.3, 6.6; maxillary tooth row, 7.3, 7.5, 7.4; length of mandible (to front of canine), 13.4, 13.6, 13.8.

Remarks.—In this species there is considerable geographic and individual variation in color, size, and proportions. Generic distinction of the small fish-eating bat from the larger, typical form of the genus is not indicated, and the name *Dirias* should be discarded even as a subgenus.

The earliest published specific name for the small *Noctilio* is *Vespertilio labialis* Kerr (Animal Kingdom, p. 93, 1792). Kerr's description of *labialis* is based on Pennant's Peruvian bat variety β (Syn. Quad., p. 365, 1771). According to Pennant (and Kerr) the species "inhabits Peru and the Mosquito shore," eastern Nicaragua.

Pennant added that the bat of the latter locality "differs from the former in size, being less; in all other respects agreed." An examination of available material from South and Central America and comparisons with published measurements show that the Colombian-Venezuelan and Central American representatives of the species indeed average smaller than the Peruvian form. It is best, therefore, to conserve the name *minor* Osgood for the northern race, while the type locality of *Noctilio labialis labialis* Kerr is restricted to Peru, more specifically to the lower Río Ucayali region in the department of Loreto. Individual variation in color is so great among the fish-eating bats that in selecting a type locality for a described form of uncertain origin little importance can be attached to the color of underparts, whether gray, buffy, orange, or red. *Noctilio zaparo* Cabrera (Proc. Biol. Soc. Washington, vol. 20, p. 57, 1907), from Ahuano, Río Napo, eastern Ecuador, agrees in size with the north-eastern Peruvian *labialis* and must now be regarded a synonym of it. The name *Noctilio albiventer* Spix (Simiarum et Vespert. Brasil., p. 58, 1823) based on a bat from the Rio São Francisco, Bahia, Brazil, is preoccupied by *Noctilio albiventris* Desmarest (Nouv. Dict. Hist. Nat., vol. 23, p. 15, 1818), based on a specimen from "l'Amérique méridionale." Unless comparisons of the type specimens with each other and with typical *labialis* show otherwise, the white-bellied bat of eastern Brazil should be known as *Noctilio labialis albiventer* Desmarest.

Three specimens of the La Gloria series and the individual from Río Guaimaral are in the bright-orange color phase; the remaining two specimens are in the brown phase. The underparts are approximately a tone paler than the upperparts. The pale median dorsal stripe is well defined in the brown-phase individuals, weakly evident in two of the others, barely suggested in another and absent in the sub-adult from Río Guaimaral.

CHILONYCTERIS RUBIGINOSA FUSCA Allen

Chilonycteris rubiginosa, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 20, p. 457, 1904 (Cacagualito).

Chilonycteris rubiginosa fusca ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 30, p. 262, 1911.

Type locality.—Las Quiguas, 5 miles south of Puerto Cabello, northern Venezuela; altitude 650 feet.

Specimens collected.—Six. Colonia Agrícola de Caracolicito, southern slope of Sierra Nevada de Santa Marta, 2 males, 3 females; Norosí, Bolívar, 1 male.

Measurements.—Head and body, 62–75; tail, 19–25; hind foot, 12–14; ear, 21–22; forearm, 57.0–62.0; greatest length of skull, 21.6–23.3; condylobasal length, 20.5–21.7; zygomatic breadth, 12.3–12.7; inter-

orbital constriction, 4.2–4.6; greatest width across rostrum, 7.9–8.4; maxillary tooth row, 9.0–9.5.

Remarks.—In the absence of any opinion indicating otherwise, the name *Chilonycteris rubiginosa fusca* Allen applies to the race of *Chilonycteris rubiginosa* found in Venezuela, Colombia, and Central America north into Guatemala.

MICRONYCTERIS MEGALOTIS MEGALOTIS Gray

Phyllophora megalotis GRAY, Ann. Mag. Nat. Hist., vol. 10, p. 257, 1842.

Micronycteris megalotis, BANGS, Proc. New England Zool. Club, vol. 1, p. 101, 1900 (Santa Marta).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 190, 1900 (Bonda).

Micronycteris megalotis f. *typica*, ANDERSEN, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 53, 1906 (revision).

Micronycteris megalotis mexicana, ANDERSEN (*nec* Miller), Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 54, 1906 (Bogotá).

Micronycteris megalotis megalotis, SANBORN, Ann. Carnegie Mus., vol. 21, p. 173, 1932 (Bonda; Aguachica; El Tambor, Santander; Jaraquiel).

Type locality.—Brazil.

Specimens collected.—Twenty. Río Guaimaral, 7 males (3 in alcohol), 7 females (5 in alcohol); Río Cesar, 2 males (in alcohol); Villanueva, 2 males (in alcohol), 1 female (in alcohol); Río Tarra, upper Río Catatumbo, Norte de Santander, 1 female.

Measurements.—Total length, 56–65; tail, 12–16; hind foot, 9–11; ear, 21.0–23.0; forearm, 32.7–35.1 (of a male in alcohol, 36.5); length of skull. to front of canine, 17.5–18.5; zygomatic breadth, 8.2–9.1; mastoid breadth, 8.0–8.4; interorbital constriction, 3.6–3.9; across cingula of canines, 3.1–3.2; M^{3-3} , 5.6–6.0.

Remarks.—The northern Colombian specimens grade into the larger *M. m. mexicana* Miller.

MICRONYCTERIS MINUTA Gervais [vel MICRONYCTERIS HYPOLEUCA Allen]

Schizostoma minutum Gervais, Expédition dans les parties centrales de l'Amérique du Sud, Zool., Mamm., livr. 15, sheet 7, p. 50, pl. 7, fig. 1, pl. 10, figs. 4, 4a (not 5, 5a as cited in text), 1856.

Micronycteris hypoleuca ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 90, 1900.

Micronycteris minuta, ANDERSEN, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 55, 1906 (revision).

Type locality.—Of *M. minuta* Gervais, Capella Nova, Minas Gerais, Brazil; of *M. hypoleuca* Allen, Bonda, Colombia.

Remarks.—*Micronycteris hypoleuca*, known from a skin without skull, is questionably referred to *minuta* by Andersen (*op. cit.*). No specimens positively identified as *minuta* have been recorded from Colombia.

XENOCTENES HIRSUTUS Peters

Schizostoma hirsutum PETERS, Monatsb. Akad. Wiss. Berlin, 1869, p. 396.—DOBSON, Catalogue of the Chiroptera in the British Museum, p. 477 (measurements of type, p. 480), 1878.

Micronycteris hirsutus, THOMAS, Ann. Mag. Nat. Hist., ser. 7, vol. 2, p. 318, 1898 (Pozo Azul, Costa Rica, 2 specimens in alcohol).—ANDERSEN, *ibid.*, vol. 18, p. 57, 1906 (Pozo Azul, Costa Rica; measurements, p. 64).

Xenotenes hirsutus, SANBORN, Ann. Carnegie Mus., vol. 21, p. 173, 1932 (Mamatoco, 1 specimen; measurements).—HAYMAN, Journ. Mamm., vol. 19, p. 103, 1938 (Trinidad, 2 specimens in alcohol).—GOODWIN, Bull. Amer. Mus. Nat. Hist., vol. 87, p. 302, 1946 (2 specimens, Costa Rica).

Type locality.—Unknown. Designated as Pozo Azul, Costa Rica, by Goodwin (Bull. Amer. Mus. Nat. Hist., vol. 87, p. 302, 1946).

Specimens collected.—Three. Villanueva, Magdalena, 2 males, 1 female.

Measurements.—Those of the female followed by those of the two males. Head and body, 66, 60, 65; tail, 18, 15, 16; hind foot, 14, 12, 13; ear, 26, 25, 25; forearm, 45.4, 44.7, 44.5; third metacarpal, 35.1, 35.5, 35.7; first phalanx of third digit, 15.9, 15.4, 17.4; second phalanx of third, 17.0, 16.7, 19.1; third phalanx of third, 13.1, 13.2, 13.0; fourth metacarpal, 36.0, 36.4, 37.0; length of skull (to front of canine), 23.5, 22.5, —; mastoid width, 10.0, —, —; zygomatic breadth, 11.8, 11.6, —; maxillary width across third molars, 7.4, 7.4, 7.5; interorbital constriction, 4.9, 4.8, 5.2; distance across cingula of canines, 4.3, 4.4, 4.4; maxillary tooth row, 9.3, 9.6, 9.5; length of mandible (to front of incisors), 16.3, 16.2, 16.7.

Remarks.—Besides the type preserved in alcohol in the Paris Museum, four specimens from Costa Rica, two from Trinidad, and four from northern Colombia have now been recorded. Two other specimens from Trinidad are in the collection of the Chicago Museum of Natural History.

MACROPHYLLUM MACROPHYLLUM Schinz

Phyllost[oma] macrophyllum SCHINZ ("P. Max"), Das Thierreich, vol. 1, p. 163 1821.

Dolichophyllum macrophyllum, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 91, 1900 (Bonda).

Type locality.—Rio Mucurí, Minas Gerais, Brazil (see Wied-Neuwied, Beiträge zur Naturgeschichte Brasiliens, vol. 2, p. 192, 1826).

TONATIA AMBLYOTIS Wagner

Phyllostoma amblyotis WAGNER, Wiegmann's Arch. Naturg., Jahrg. 9, vol. 1, p. 365, 1843.

Chrotopterus auritus, ALLEN (*nec* Peters), Bull. Amer. Mus. Nat. Hist., vol. 13, p. 91, 1900 (Bonda).

Tonatia amblyotis, GOODWIN, Journ. Mamm., vol. 23, p. 208, 1942 (Bonda; revision).

Type locality.—Matto Grosso, Brazil.

Specimens collected.—Three. Las Marimondas, Sierra de Perijá, 1 male, 2 females.

PHYLLOSTOMUS HASTATUS PANAMENSIS Allen

Phyllostomus hastatus, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 90, 1900 (Bonda); vol. 20, p. 457, 1904 (Bonda).

Phyllostomus hastatus panamensis ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 20, p. 233, 1904.

Phyllostomus hastatus cauræ ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 20, p. 234, 1904 (type locality, Cali, upper Río Cauca Valley, Colombia).

Phyllostomus hastatus caucæ [sic], ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 25, p. 225, 1916 (Río Frío, upper Río Cauca Valley).

Phyllostomus hastatus subsp. SANBORN, Ann. Carnegie Mus., vol. 21, p. 175, 1932 (Sautatá, Río Atrato; Mamatoco).

Type locality.—Boquerón, Chiriquí, Panamá.

Specimens collected.—Thirty-six. Villanueva, 8 males (2 in alcohol), 22 females (4 in alcohol); Río Guaimaral, 4 males (1 in alcohol); Las Marimondas, 1 male; Norosí, Bolívar, 1 female.

Measurements.—The means and extremes of the external measurements are taken from 28 adults, those of the cranial measurements are from 20 of the adults. Total length, 133 (127–150); tail, 22 (17–25); hind foot, 22.7 (20–25); ear, 32.8 (28–34); forearm, 86.7 (82–90.3), of 7 specimens in alcohol, 86.3–93.1; greatest length of skull, 38.2 (36.7–39.5); condylobasal length, 33.9 (32.9–35.0); zygomatic breadth, 20.7 (20.0–21.6); maxillary tooth row, 13.6 (13.1–14.1).

Remarks.—The above have been compared with typical *panamensis* and with 14 specimens representing *P. h. hastatus* from Venezuela (La Guaira, Macuto, San Julián, Suapure). The measurements confirm the larger average size of the Panamanian and Colombian race. On the other hand, *P. hastatus paeze* Thomas (Ann. Mag. Nat. Hist., ser. 9, vol. 13, p. 235, 1924) from Bogotá, but more probably from east of Bogotá in the upper Río Meta region, is described as similar but with a proportionately shorter skull (greatest length, 35 mm.). Two specimens from Villavicencio, upper Río Meta, and another from Cúcuta, north of Bogotá (collection of Chicago Natural History Museum), agree with *panamensis* in every respect. The status of *paeze*, therefore, still remains obscure. The central Colombian *cauræ*, purportedly larger than *panamensis*, represents simply a large population of this race.

TRACHOPS CIRRHOSUS Spix

Vampyrus cirrhosus SPIX, Simiarum et vespertilionum Brasiliensium species novae, p. 64, pl. 36, fig. 3, 1823.

Trachops cirrhosus, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, 1900 (Bonda).—SANBORN, Ann. Carnegie Mus., vol. 21, p. 175, 1932 (Sautatá, Río Atrato).

Type locality.—Brazil.

Specimens collected.—Twenty. Río Guaimaral, Río Cesar, near Valencia, 7 males (1 in alcohol), 6 females (4 in alcohol), 1 skull

only, 2 skeletons only; El Orinoco, Río Cesar, 2 females; Norosí, Bolívar, 1 female; Las Marimondas, 1 male (suckling young; in alcohol).

Measurements.—Head and body, 77–88; tail, 17–21; hind foot, 18–22; ear, 34–39; forearm, 58–63.1; third metacarpal, 46.3–51.5; condylo-basal length, 25.3–27.3; zygomatic breadth, 14.1–15.7; mastoid breadth, 12.9–14.0; interorbital constriction, 4.9–5.7; maxillary tooth row, 10.2–10.8.

Remarks.—The only other species of *Trachops* known is the smaller *coffini* Goldman from Guatemala.

GLOSSOPHAGA SORICINA SORICINA Pallas

Vespertilio soricinus PALLAS, *Miscellanea zoologica*, p. 48, pls. 5 and 6, figs. 16–18, 1766.

Glossophaga soricina, ALLEN, *Bull. Amer. Mus. Nat. Hist.*, vol. 13, p. 89, 1900 (Bonda).—SANBORN, *Ann. Carnegie Mus.*, vol. 21, p. 176, 1932 (Jaraquiel; Aguachica).

Glossophaga soricina soricina, MILLER, *Proc. U. S. Nat. Mus.*, vol. 46, p. 419, 1913 (Bonda; revision).

Type locality.—Surinam (restricted by Miller, *U. S. Nat. Mus. Bull.* 79, p. 39, 1912).

Specimens collected.—Nine. Villanueva, 3 females; Sierra Negra, Sierra de Perijá, 1 male; Las Marimondas, Sierra de Perijá, 1 male; Guamalito, 2 females; Río Guaimaral, 2 females (in alcohol).

Measurements.—Those of the three females from Villanueva are given. Head and body, 62–67; tail, 53–59; hind foot, 8–10; ear, 10–11; forearm, 34.9–35.6 (of two females in alcohol, 35.2, 34.2; third metacarpal, 33.5, 33.7; first phalanx of third finger, 12.4, 12.5; second phalanx of third finger, 14.1, 15.0); condylo-basal length, 19.1–19.8; width of brain case, 8.4–8.7; upper tooth row (I to M³), 7.9–8.3; lower canine to back of M₃, 7.3–7.6.

Remarks.—The Sierra Negra specimen is erythristic, the male from Las Marimondas blackish brown. The others are in various intermediate stages. One of the Villanueva specimens (U.S.N.M. No. 281272) has a small supernumerary premolar in the left upper jaw in the space between the canine and Pm². Another specimen, from Guamalito, has lost in some accident the molars of both lower jaws; the alveoli are ossified but the mandibles are otherwise complete.

GLOSSOPHAGA LONGIROSTRIS LONGIROSTRIS Miller

Glossophaga longirostris MILLER, *Proc. Acad. Nat. Sci. Philadelphia*, 1898, p. 330.—BANGS, *Proc. New England Zool. Club*, vol. 1, p. 101, 1900 (Santa Marta Mountains).—ALLEN, *Bull. Amer. Mus. Nat. Hist.*, vol. 13, p. 89, 1900 (Taganga; Bonda).

Glossophaga longirostris longirostris, MILLER, *Proc. U. S. Nat. Mus.*, vol. 46, p. 422, 1913 (Bonda; Taganga; revision).—SANBORN, *Ann. Carnegie Mus.*, vol. 21, p. 176, 1932 (Taganga; Mamatoco).

Type locality.—Sierra Nevada de Santa Marta, near Santa Marta, Magdalena, Colombia.

Specimens collected.—Seven. Villanueva, 5 males, 2 females (in alcohol).

Measurements.—Head and body, 55–63; tail, 6–9; hind foot, 12–13; ear, 16–17; forearm, 37.2–39.8 (of two females in alcohol, 39.4, 39.3; third metacarpal, 38.5, 38.1; first phalanx of third finger, 14.1, 14.1; second phalanx of third finger, 18.4, 16.9); condylobasal length, 22.0–22.5; width of brain case, 9.1–9.5; upper tooth row (front of incisor to back of M^3), 8.8–9.4; lower canine to back of M_3 , 8.4–8.6.

Remarks.—Where this species occurs together with *G. soricina*, it is readily distinguished by larger size, longer rostrum, and smaller nose leaf. The incisors are present in all above specimens. The dentition of this bat, as well as of all the other species of glossophagines, is weak and frequently defective. Where teeth are missing, the loss appears to be the result of some violence, most probably in connection with the bat's voracious attacks on soft pulpy fruit containing hard pits.

LONCHOGLOSSA CAUDIFERA CAUDIFERA Geoffroy

Glossophaga caudifer GEOFFROY, Mem. Mus. Hist. Nat., Paris, vol. 4, p. 418, pl. 17, 1818.

Lonchoglossa caudifera caudifera, SANBORN, Publ. Field Mus. Nat. Hist., zool. ser., vol. 20, p. 27, 1933 (revision); vol. 27, p. 375, 1941 (Cúcuta).

Type locality.—Rio de Janeiro, Brazil.

Specimens collected.—Five. Pueblo Bello, Sierra Nevada de Santa Marta, 2 males (1 in alcohol); Sierra Negra, Sierra de Perijá, 2 males, 1 female.

Measurements.—Those of a young adult male from São Sebastião, São Paulo, Brazil, given in parentheses, head and body, (60) 55–59; tail, 4–7; hind foot, (10) 10–12; ear, 14–14; forearm, (36) 34–37; metacarpal of third finger, (35.4) 35.4–37.3; first phalanx of third finger, (13.6) 11.5–13.1; second phalanx of third finger, (18.2) 17.7–19.9; greatest length of skull, 21.5–22.7; condylobasal length, (21.1) 20.7–22.4; width of brain case, 8.6–8.7 (2 specimens); postorbital constriction, (4.3) 4.2–4.5; maxillary tooth row, (7.9) 7.8–8.4; distance across third upper molars, (5.1) 5.4–5.7.

Remarks.—Assignment of the Colombian series to typical *caudifera* is provisional. The only other recognized form of the genus is *L. caudifera aequatoris* Lönnberg from western Ecuador. This race is known from too little material for exact determination of its distinctive characters. It is said to be darker in color and smaller in cranial and wing measurements.

CAROLLIA PERSPICILLATA PERSPICILLATA Linnaeus

Vespertilio perspicillatus LINNAEUS, *Systema naturae*, ed. 10, p. 31, 1758.

Hemiderma brevicauda, BANGS, *Proc. New England Zool. Club*, vol. 1, p. 101, 1900 (Santa Marta; Pueblo Viejo; Palomino).—ALLEN, *Bull. Amer. Mus. Nat. Hist.*, vol. 13, p. 90, 1900 (Bonda); vol. 20, p. 457, 1904 (Cacagualito).

Hemiderma perspicillatum, HAHN, *Proc. U. S. Nat. Mus.*, vol. 32, p. 108, 1907 (Santa Marta; revision).

Carollia perspicillata perspicillata, SANBORN, *Ann. Carnegie Mus.*, vol. 21, p. 176, 1932 (Sautatá, Río Atrato; Mamatoco; Bonda).

Type locality.—Surinam (fixed by Thomas, *Proc. Zool. Soc. London*, 1911, p. 130).

Specimens collected.—Seventy-nine. Pueblo Bello, Sierra Nevada de Santa Marta, 6 males (1 in alcohol), 21 females (6 in alcohol); El Salado, Sierra Nevada de Santa Marta, 4 males, 2 females; Río Guainaral, 1 male, 3 females (in alcohol); El Orinoco, 1 male; Villanueva, 8 males, 5 females (1 in alcohol); Sierra Negra, 17 males, 5 females; Río Tarra, 2 males, 1 female; Norosí, 1 male, 1 female; Guamalito, 1 female (in alcohol).

Remarks.—The collection includes two erythristic individuals, both males and both from Villanueva. The forearm varies in length from 38.2 to 44.2 millimeters, the greatest length of the skull averages 22.6.

CAROLLIA CASTANEA H. Allen

Carollia castanea H. ALLEN, *Proc. Amer. Philos. Soc.*, vol. 28, p. 19, 1890.

Hemiderma castaneum, HAHN, *Proc. U. S. Nat. Mus.*, vol. 32, p. 116, 1907 (revision; description and measurements).

Type locality.—Costa Rica.

Specimens collected.—Two. Río Tarra, upper Río Catatumbo, Norte de Santander, male and female (in alcohol).

Measurements.—Head and body, 48 (of male); tail, 7, 8; hind foot, 12, 10; ear, 17, 17; tibia, 14, 15; calcar, 6, 7; forearm, 34.3, 36.0; third metacarpal, 32.3, 34.4; first phalanx of third finger, 14.6, 14.2; second phalanx of third finger, 19.9, 20.0; third phalanx of third finger, 12.6, 13.3; fourth metacarpal, 31.4, 33.5; first phalanx of fourth finger, 12.5, 12.5; second phalanx of fourth finger, 13.5, 13.4; fifth metacarpal, 34.8, 35.6; thumb, 14, 12; nose leaf, 8.3, 8.4; distance across base of upper canines, 4.3 (female); maxillary tooth row, 6.1; length of mandible, 12.3; lower tooth row (C-M₃), 6.9.

Remarks.—*Carollia castanea* is distinguished from *C. perspicillata* by smaller size throughout, nose leaf shorter and less lanceolate in outline, outer side of tragus without the conspicuous concave subterminal emargination characteristic of *perspicillata*; shape of skull of *castanea* essentially as in *perspicillata* but markedly smaller (less than 21 mm. in greatest length); inner upper incisors about a third smaller, their outline on outer surface more nearly rectangular, the lower edges chisel-shaped (subtriangular and tapering to a blunt point in *per-*

spicillata): low heel of upper first premolar without a distinct cusp; space between first and second upper premolars accentuated on inner side by the oblique angle of the anterointernal corner of the second premolar; posterointernal cusp of second upper premolar obsolete, the tooth situated medially of the first molar and breaking the line along the outer surface of the cheek teeth; outer surface of lower premolars triangular in outline, the teeth about as high as long, the second premolar larger than the first; first lower molar not as high as second and third molars, its crown surface nearly smooth, the cusps indistinct, the outline of the tooth contrasting sharply with that of the second lower molar.

Beside Costa Rica and Colombia, the species has been recorded from Panamá, Honduras, and British Guiana by Goodwin (Bull. Amer. Mus. Nat. Hist., vol. 70, p. 32, 1942; vol. 87, p. 316, 1946) and from Ecuador and Peru by Thomas (Proc. U. S. Nat. Mus., vol. 58, p. 222, 1920).

STURNIRA LILIUM PARVIDENS Goldman

Sturnira lilium parvidens GOLDMAN, Proc. Biol. Soc. Washington, vol. 30, p. 116, 1917.

Type locality.—Papayo, about 25 miles northwest of Acapulco, Guerrero, México.

Specimens collected.—Two. Sierra Negra, Sierra de Perijá, 1 male, 1 female.

Measurements.—Head and body, 63, 59; hind foot, 13, 13; ear, 16, 16; forearm, 39.3, 40.3; greatest length of skull, 21.5, 21.5; condylobasal length, 19.4, 19.5; zygomatic breadth, 12.8, —; width of brain case, 9.9, 10.0; interorbital constriction, 5.7, 5.9; maxillary tooth row, 6.3, 6.3.

Remarks.—The epaulettes of the male are straw-colored. In a series of five males from Paraguay the epaulettes are absent in one, bright yellow to rusty red in the others.

STURNIRA LUDOVICI Anthony

Sturnira ludovici ANTHONY, Amer. Mus. Nov. No. 139, p. 8, 1924.

Sturnira lilium bogotensis SHAMEL, Proc. Biol. Soc. Washington, vol. 40, p. 129, 1927 (type locality, Bogotá, Colombia).

Sturnira hondurensis GOODWIN, Amer. Mus. Nov. No. 1075, p. 1, 1940 (type locality, La Cruz Grande, near San José, La Paz, Honduras).

Type locality.—Near Gualea, Pichincha, northwestern Ecuador.

Specimens collected.—Four. Sierra Negra, Sierra de Perijá, 2 males, 2 females.

Measurements.—Those of the type specimen of *bogotensis* Shamel are given in parentheses. Head and body, 65–70; hind foot, 13–15; ear, 18–19; forearm, (45.4) 44.2–46.0; greatest length of skull, (24.0) 22.9–24.2; condylobasal length, (22.0) 21.3–22.4; zygomatic breadth, (13.4) 13.2–13.8; interorbital constriction, (6.4) 6.2–6.7; width of

brain case, (10.5) 10.3–10.7; maxillary tooth row, (6.9) 6.5–7.0; width across bases of incisors, (6.0) 6.0–6.8.

Remarks.—The genus *Sturnira* is represented in Colombia by at least two well-defined species. The first, *S. lilium*, is characterized by its comparatively short rostrum, short forearm (40.44 mm. in 12 topotypes from Paraguay), trilobate lower incisors with the middle lobe nearly as large as the outer ones, paraconids, metaconids, and entoconids of first two lower molars distinct and separated by deep valleys, upper molar row symmetrically curved (compare Miller, U. S. Nat. Mus. Bull. 57, pl. 4, fig. 3, 1907). The second, *Sturnira ludovici*, resembles *S. lilium* externally and in shape of skull but averages larger, lower incisors deeply bilobate in young individuals, simple or weakly bilobate, often with a minute middle lobe, in fully adult specimens; paraconids and metaconids of first two lower molars low, poorly defined, the entoconids suppressed with no division between them and the metaconids, the median longitudinal groove of these molars not so well defined as in *S. lilium*, the second upper molar turned inward and not in line with the first molar.

The range of *Sturnira ludovici* encompasses and exceeds that of *S. lilium parvidens*. The present series of *ludovici* was taken in the same locality as were two specimens of *S. lilium parvidens*. Two skulls from Mirador, México, in the United States National Museum collection represent *ludovici*, and another skull from the same locality is referable to *S. lilium parvidens*. *Sturnira hondurensis* Goodwin, described from Honduras and recorded from Costa Rica, *Sturnira lilium bogotensis* Shamel from Bogotá, and, in the collection of the Chicago Natural History Museum, 12 specimens from western Ecuador and one from San Esteban, Venezuela, are all referable to *S. ludovici*.

Another species nearly related to *Sturnira ludovici* has been described from Costa Rica as *Sturnirops mordax* Goodwin (Amer. Mus. Nov. No. 976, p. 1, 1938). Except for its long rostrum with the attendant greater curvature of the maxillary tooth row and the attenuation of the mandibles, *S. mordax* is practically indistinguishable from *ludovici* in external, cranial, and dental characters. Full generic separation of *mordax* from *Sturnira lilium* is hardly advised in view of the close relationship to the annectant *S. ludovici*.

URODERMA BILOBATUM Peters

Uroderma bilobatum PETERS, Monatsb. Akad. Wiss. Berlin, 1866, p. 394.—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 89, 1900 (Bonda; Cacagualito; Minca).—ANDERSEN, Proc. Zool. Soc. London, 1908, p. 217 (Onaca; revision).—SANBORN, Ann. Carnegie Mus., vol. 21, p. 177, 1932 (Bonda; Cacagualito; Minca).

Type locality.—São Paulo, Brazil.

Specimens collected.—Thirty-eight. Colonia Agrícola de Cara-

colicito, 2 males, 9 females (1 in alcohol), 1 skull only; Pueblo Bello, Sierra Nevada de Santa Marta, 1 male (in alcohol), 1 female (in alcohol); Río Guaimaral, 3 males (1 in alcohol), 1 female (in alcohol); Villanueva, 4 males, 5 females; Sierra Negra, 1 male, 3 females; Norosí, 1 male; Río San Pedro, Norosi, 1 female (in alcohol); Guamalito, Norte de Santander, 1 male (in alcohol), 4 females (1 in alcohol).

Measurements.—Head and body, 59–70; hind foot, 11–14; ear, 15–19; forearm, 39.2–44.5; greatest length of skull, 21–1–22.6.

VAMPIROPS UMBRATUS Lyon

Vampyrops lineatus, BANGS (nec Geoffroy), Proc. New England Zool. Club, vol. 1, p. 100, 1900 (San Antonio; Palomino; San Miguel).

Vampyrops umbratus LYON, Proc. Biol. Soc. Washington, vol. 15, p. 151, 1902.

Type locality.—San Miguel, Río Macotama, northern slope of the Sierra Nevada de Santa Marta, Colombia; altitude, 5,260 feet.

Specimens collected.—Five. Sierra Negra, Sierra de Perijá, 4 males (2 in alcohol), 1 female.

Measurements.—Head and body, 66, 66, 62; hind foot, 12, 14, 12; ear, 19, 19, 20; forearm, 42.1, 40.8, 41.7 (of one male in alcohol, 43.7); (the following are of a single male specimen) greatest length of skull, 25 (c.); basal length, 20.4; zygomatic breadth, 15.5 (c.); width of brain case, 10.6; mastoid width, 12.5; interorbital width, 6.2; distance across canines, 6.6; M_2-2 , 10.8; maxillary tooth row, 9.3; greatest length of mandible, 17.4; lower canine to back of M_3 , 9.9.

Remarks.—The presents eries brings to eight the known number of specimens of the species. The measurements of *V. oratus* Thomas agree with those of *umbratus*, but that species is said to have ledges on the inner sides of the lower molars not present in *umbratus*. *V. vittatus* Peters, recorded from the same region, is a much larger species.

VAMPIROPS VITTATUS Peters

Artibeus vittatus PETERS, Monatsb. Akad. Wiss. Berlin, 1859, p. 225.

Vampyrops vittatus, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 88, 1900 (Valparaiso).—MILLER, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 106, footnote (Valparaiso; measurements).

Type locality.—Puerto Cabello, Carabobo, Venezuela.

VAMPYRESSA THYONE Thomas

Vampyressa thyone THOMAS, Ann. Mag. Nat. Hist., ser. 8, vol. 4, p. 231, 1909.

Type locality.—Chimbo, Bolívar Province, western slope of Cordillera Occidental, western Ecuador; altitude, 1,000 feet.

Specimens collected.—One. Colonia Agrícola de Caracolicito, southern slope of the Sierra Nevada de Santa Marta, 1 female.

Measurements.—Head and body, 49; hind foot, 10; ear, 14; forearm, 31.5; greatest length of skull, 18.2 (c.); condylobasal length, 16.6; zygomatic breadth, 10.8; mastoid breadth, 9.4; width of brain case,

9.3 (c.); interorbital breadth, 4.6; maxillary tooth row, 5.4 (c.); length of mandible to front of incisors, 11.7.

Remarks.—The six described species of *Vampyressa* are separable into two groups. The first includes the small species *thyone* Thomas, *minuta* Miller,¹ and *renilla* Thomas.² In these the forearm measures 30 to 33 mm. in length, the skull between 17 and 19 mm. in greatest length. The second group includes the larger species, *pusilla* Wagner,³ *nymphaea* Thomas,⁴ and *melissa* Thomas,⁵ with forearm between 35 and 38 mm., skull 20 to 22 mm. in greatest length. The geographic range of both groups are coextensive in South America. Only the small *minuta* is known from Central America (Panamá). Both the small *V. thyone* and the large *V. nymphaea* have been recorded from the Chocó in western Colombia, and two specimens of *thyone* (identified by Thomas) are available from Amazonian Ecuador. *V. minuta* is almost certainly an absolute synonym of *thyone*; hence the use of the latter name for the specimen of the present collection.

CHIRODERMA JESUPI Allen

Chiroderma jesupi ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 88, 1900.

Type locality.—Cacagualito, a plantation, now abandoned, 20 miles east of Santa Marta on the road to Río Hacha, Magdalena, Colombia.

ARTIBEUS JAMAICENSIS JAMAICENSIS Leach

Artibeus Jamaicensis LEACH, Trans. Linn. Soc. London, vol. 13, pt. 1, p. 75, 1821.

Uroderma planirostris, BANGS, Proc. New England Zool. Club, vol. 1, p. 101, 1900 (Santa Marta).

Artibeus planirostris, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 20, p. 458, 1904 (Mamatoco).

Artibeus jamaicensis, ANDERSEN, Proc. Zool. Soc. London, 1908, p. 247 (part).

Type locality.—Jamaica.

Specimens collected.—Three. El Salado, eastern slope of Sierra Nevada de Santa Marta, 1 male, 1 female; Río Guaimaral, 1 male (in alcohol).

Measurements.—Head and body, 75, 74; hind foot, 14, 15; ear, 22, 22; forearm, 55.6, 54.8 (of the male in alcohol, 56.0); length of skull to front of canine, 27.3, 26.6; zygomatic breadth, 16.1, 16.1; width of brain case, 11.9, 11.9; mastoid breadth, 14.1, 14.3; maxillary width across first molars, 11.6, 11.1; width across cingula of canines, 7.5, 7.2; canine to back of second molar, 9.9, 9.4; canine to back of third molar (in male only), 10.1; length of mandible to front of incisors, 18.3, 18.4.

Remarks.—According to Andersen's classification of the genus

¹ Proc. U. S. Nat. Mus., vol. 42, p. 25, 1912.

² Ann. Mag. Nat. Hist., ser. 9, vol. 13, p. 532, 1924.

³ Arch. Naturg., vol. 1, p. 366, 1843.

⁴ Ann. Mag. Nat. Hist., ser. 8, vol. 4, p. 230, 1909.

⁵ Ann. Mag. Nat. Hist., ser. 9, vol. 18, p. 157, 1926.

Artibeus (Proc. Zool. Soc. London, 1908, pp. 224–319) the female of the pair from El Salado is properly identified as *A. jamaicensis*, owing to the absence of the rudimentary third upper molar. The male, taken together with the female, has a third upper molar in each jaw and should be referred to *A. planirostris planirostris*. However, both specimens are so obviously alike otherwise that it would be folly to persist in the illusion that the presence or absence of the evanescent third upper molar is of more than individual or local significance. Examination of the large series of *Artibeus* in the collections of the United States National Museum and of the Chicago Natural History Museum confirms the absolute unreliability of the dental formula for separating *A. jamaicensis* from *A. planirostris*. The indications are that the number of upper molars may be an individual as well as a geographic variable. The incidence of M^3 appears to be highest in the *Artibeus* of Brazil, upper Amazonia, the Guianas, Trinidad, and the Grenadines and lowest in Paraguay, the trans-Andean regions, and in Central America and México. Whatever Andersen may have had in mind, the relationship between the form of the posterior border of M^2 and the presence or absence of M^3 pointed out by him (*op. cit.*, p. 252) has no specific significance. The posterior border of the second upper molar may be emarginate where no trace of M^3 exists, and it is not always emarginate in the presence of M^3 . The third upper molar may occupy any position behind the second molar whether or not the posterior border of the latter is notched. In some series where no third upper molar appears, an alveolus in various stages of obsolescence may be present. In conclusion, it appears that the small form, *A. planirostris* Spix, cannot be treated as other than a specific synonym of the similarly small *A. jamaicensis* Leach.

Living side by side with *A. jamaicensis* is a markedly larger species, the largest of the genus. The specimens of this species taken in El Salado and other nearby localities are listed and discussed below under the heading *Artibeus lituratus palmarum*. If Andersen were again followed, this large species would be identified as *A. jamaicensis palmarum*, thus recording the unhappy situation of two "races" of the same species occupying identical habitats.

ARTIBEUS LITURATUS PALMARUM Allen and Chapman

Artibeus palmarum ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., vol. 9, p. 16, 1897.—ALLEN, *ibid.*, vol. 13, p. 89, 1900 (Bonda; *femurvillosum* Bangs, a synonym).—G. M. ALLEN, Bull. Mus. Comp. Zool., vol. 52, p. 42, 1908 (*femurvillosum*, synonym).

Artibeus femurvillosum BANGS, Proc. New England Zool. Club, vol. 1, p. 73, 1899 (La Concepción, type locality); vol. 1, p. 101, 1900.

Artibeus jamaicensis palmarum, ANDERSEN, Proc. Zool. Soc. London, 1908, p. 278 (revision).

Type locality.—Trinidad.

Specimens collected.—Twenty-three. Pueblo Bello, 2 males (in alcohol); El Salado, 2 males; Colonia Agrícola de Caracolicito, 1 male; Sierra Negra, Sierra de Perijá, 4 males, 14 females.

Measurements.—Head and body, 87–100; hind foot, 16–21; ear, 23–25; forearm, 66–73.6; length of skull to front of incisors, 29.2–31.5; mastoid width, 15.7–16.9; width of brain case, 13.0–13.9; zygomatic breadth, 18.4–19.6; maxillary width across first molars, 12.8–14.1; width across cingula of canines 8.6–9.1; canine to back of second upper molar, 10.8–11.4; length of mandible to front of incisors, 20.7–21.9.

Remarks.—The abundant and reliable data presented by Andersen (*op. cit.*) in his revision of the genus *Artibeus* do not support his conclusions that *A. planirostris* and *A. jamaicensis* are distinct species each composed of a group of large and a group of small races. Once the presence or absence of the rudimentary third upper molar is discounted as a variable (see "Remarks" under *A. jamaicensis*), nothing is left by which to distinguish the large "race" of Andersen's *planirostris* from the large ones of his *jamaicensis*, and the small "races" of his *planirostris* from the corresponding ones of *jamaicensis*. It becomes clear, then, that the smaller "races" of each compose one species which should be designated as *jamaicensis* Leach, and the larger "races" form together another species for which the earliest available name is *lituratus* Olfers.⁶ Andersen could not demonstrate intergradation between the large and the small "races" composing each of his species. He implied, however, that additional material would show this. Moreover, he interpreted the occurrence of individuals of both the large and the small "races" in any one locality as a migratory invasion of the one into the territory of the other. This conjecture is baseless. The considerable amount of material since accumulated (also, see Anthony, Amer. Mus. Nov. No. 114, p. 5, 1924) confirms the specific discreteness of the large and small forms and adds to the very evidence presented, but otherwise either ignored or misinterpreted, by Andersen himself, that the normal range of both species, the large and the small, is coextensive from México into southern Brazil, and on some of the Neotropical islands. The subspecific names recognized as valid by Andersen plus two forms, *richardsoni* and *fraterculus*, described since, may be arranged as follows:

Artibeus jamaicensis jamaicensis Leach, type locality, Jamaica (*richardsoni* Allen, with type locality, Matagalpa, Nicaragua, a synonym).

A. j. parvipes Rehn, type locality, Cuba.

A. j. yucatanicus Allen, type locality, Chichén-Itzá, Yucatán, México.

⁶ "Ph. *lituratus* Ill.," in Eschwege, "Journal von Brasilien," Neue Bibliothek der Reisebeschreibungen zur Erweiterung der Erd- und Völkerrunde, Weimar, vol. 15, No. 2, p. 224, 1818, antedates "*Phyllostomus lituratus* Ill.," Lichtenstein, Verzeichniss der Doubletten . . . , p. 3, 1823. Both authors based the name *lituratus* on Azara's *chauve souris obscure et rayée*, Olfers giving Paraguay as the type locality.

- A. j. trinitatis* Andersen, type locality, Trinidad (*grenadensis* Andersen, with type locality, Grenada, W. I., a synonym).
A. j. fraterculus Anthony, type locality, Portovelo, El Oro Province, southern Ecuador.
A. j. planirostris Spix, type locality, Bahia, Brazil.
Artibeus lituratus lituratus Olfers, type locality, Paraguay.
A. l. fallax Peters, type locality, Guiana.
A. l. palmarum Allen and Chapman, type locality, Trinidad.
A. l. praeceps Andersen, type locality, Guadeloupe, W. I. (doubtfully distinct from *palmarum*; *dominicanus* Andersen, Proc. Zool. Soc. London, 1908, p. 249, a *nomen nudum*).
A. l. aequatorialis Andersen, type locality, Zaruma, southern Ecuador (doubtfully distinct from *palmarum*).

So far as can be determined from available material, separation of the large *lituratus* from the small *A. jamaicensis* is based solely on size. There is considerable range of variation in size within each of the species, and old individuals of large races of *jamaicensis* may equal, and even exceed, in size small (usually subadult) individuals of small races of *lituratus*. In view of the difficulty in distinguishing subadults from fully adults, it is not always possible to separate the species, especially of their respective West Indian and North American representatives. In general, the forearm of *lituratus* is normally longer than 62 mm. to a maximum of about 75 mm. In *jamaicensis*, the forearm is usually less than 63 mm. and may be as short as 50 mm. Mensural differences between the two species in other external and in cranial characters are in the same proportions.

None of the specimens of *palmarum* collected in northern Colombia bears a third molar in the upper jaw. The posterior edge of the second molar in this series varies from deeply emarginate to convex. In some individuals there is a bony ledge of the maxillary behind the second molar; in others the ledge, which could support a third molar, is lacking. The localities of these bats are included within the range of *palmarum* as given by Andersen, and they show agreement with this form, as compared with *fallax*, in size and in the consistent absence of M³.

ARTIBEUS CINEREUS BOGOTENSIS Andersen

? *Dermanura quadrivittatus*, BANGS, Proc. New England Zool. Club, vol. 1, p. 101, 1900 (Pueblo Viejo).

Artibeus cinereus bogotensis ANDERSEN, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 421, 1906.

Type locality.—Curiche, near Bogotá, Colombia.

Specimens collected.—One. Sierra Negra, Sierra de Perijá, 1 female.

Measurements.—Head and body, 58; hind foot, 12; ear, 17; forearm, 40.8; third metacarpal, 37.6; first phalanx of third digit, 14.7; second phalanx of third, 20.5; length of skull to front of canines, 19.9; mastoid width, 10.0; width of brain case, 9.3; zygomatic breadth, 11.3

(c.); maxillary width across first molars, 7.8; width across cingula of canines, 5.1; maxillary tooth row, 6.1; length of mandible to front of incisors, 12.7.

Remarks.—Andersen's classification (Proc. Zool. Soc. London, 1908, pp. 285-315) of the pygmy forms of *Artibeus* is based mainly on the presence or absence of a rudimentary third lower molar and, in the first upper molar, the degree of development of the posterointernal lobe, the hypocone ("cusp 7" of Andersen). The diagnostic value of the presence or absence of the third lower molar may be ruled out as in the case of the large species of *Artibeus* (see foregoing "Remarks" under headings *A. lituratus palmarum* and *A. jamaicensis*). In his treatment of the pygmy "species" normally lacking the third lower molar, Andersen indicated the presence of this structure in one jaw, absent in the other, of individuals of *rosenbergi* and *toltecus*.

The form of M^1 in the pygmy *Artibeus* is similar to that of the large *Artibeus* of the *jamaicensis-lituratus* group. Sufficient specimens of the latter group were available to Andersen to demonstrate the variable structure of M^1 . On the other hand, the few small localized series of pygmy *Artibeus* examined by him caused Andersen to attach undue significance to the structure of the same tooth in the pygmy species. A comparison of the molars of 8 skulls of *toltecus* from México and of 10 skulls identified as *A. toltecus ravus* from Ecuador with those of 10 skulls of *A. cinereus* from Venezuela shows complete intergradation in the size and structure of the first upper molar. In one specimen from Pambilar, northwestern Ecuador, the hypocone of this tooth is as little developed as that described for the type of *rosenbergi* from Cachaví, a locality in the same general area. The hypocones of M^1 in the remaining specimens from Ecuador (Pambilar and Carondelet) show increasing development to the condition described by Andersen as distinctive of *toltecus*. Similarly, the appearance of the hypocone of M^1 in Venezuelan series of *cinereus* ranges from the condition typical of *toltecus* to the greatly reduced one of *rosenbergi*. The specimen (U. S. N. M. No. 62635) from La Guaira, Venezuela, the only one other than the type identified by Andersen as *rosenbergi*, is simply one of the same series of bats collected by Robinson in northern Venezuela, which were assigned to *A. cinereus bogotensis* by Andersen. Additional material in the collection of the Chicago Natural History Museum confirms the specific identity of *cinereus*, *toltecus*, and *rosenbergi*. Of four specimens from San José, Manaví Province, Ecuador, not far from the type localities of *rosenbergi* and *ravus* in Esmeraldas Province, one shows "cusp 7" of M^1 as described for *ravus*, another as described for *rosenbergi*, the first upper molars of the remaining two specimens being intermediate in structure.

With the elimination of the dental characters held to be significant by Andersen, the evidence presented by that author points to the probable conspecificity of all the pygmy forms of *Artibeus* said to be otherwise indistinguishable from either *cinereus* or *toltecus*.

The following classification of the pygmy bats of the *A. cinereus* group is based on examination of specimens in the collections of the United States National Museum and the Chicago Natural History Museum. These include the types of *ravus*, *phaeotis*, *jucundum*, and *anderseni*, topotypes or near topotypes of *glaucus*, *watsoni*, *bogotensis*, *rosenbergi*, and *toltecus*, and three pygmy *Artibeus* from the upper Río Pastaza, eastern Ecuador (in the Chicago Natural History Museum), referable to either *anderseni* or *pumilio* but geographically nearer the latter. Subspecific status of some of the forms listed is provisional.

Artibeus cinereus cinereus Gervais, type locality, Brazil (*quadrivittatus* Peters, from Surinam, is probably a synonym).

Artibeus cinereus bogotensis Andersen, type locality, Curiche, near Bogotá, Colombia.

Artibeus cinereus rosenbergi Thomas, type locality, Cachaví, Esmeraldas, Ecuador (*rava* Miller, from San Javier, Esmeraldas, Ecuador, a synonym).

Artibeus cinereus glaucus Thomas, type locality, Chanchamayo, Junín, Peru.

Artibeus cinereus pumilio Thomas, type locality, Tushemo, near Masisea, Río Ucayali, Loreto, eastern Peru.

Artibeus cinereus anderseni Osgood, type locality, Porto Velho, Rio Madeira, Amazonas, Brazil.

Artibeus cinereus watsoni Thomas, type locality, Bugaba, Chiriquí, Panamá.

Artibeus cinereus toltecus Saussure, type locality, México, here restricted to Mirador, Veracruz, whence most of Saussure's Mexican material originated (*jucundum* Elliot, from Veracruz, México, a synonym).

Artibeus cinereus phaeotis Miller, type locality, Yucatán, México.

SPHAERONYCTERIS TOXOPHYLLUM Peters

Sphaeronycteris toxophyllum PETERS, Sitzb. Akad. Wiss. Berlin, 1882, p. 989, pl. 16.—SANBORN, Publ. Field Mus. Nat. Hist., zool. ser., vol. 27, p. 380, 1941 (Cúcuta, Norte de Santander).

Type locality.—South America.

DESMODUS ROTUNDUS ROTUNDUS Geoffroy

Phyllostoma rotundum GEOFFROY, Ann. Mus. Hist. Nat. Paris, vol. 15, p. 181, 1810.

Desmodus rufus, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 87, 1900 (Bonda).

Desmodus rotundus, SANBORN, Ann. Carnegie Mus., vol. 21, p. 180, 1932 (Bonda).

Type locality.—Paraguay.

Specimens collected.—Forty-seven. El Orinoco, Río Cesar, 9 males (4 in alcohol), 20 females (8 in alcohol); Villanueva, 7 males (3 in alcohol), 11 females (5 in alcohol).

Measurements.—The extremes of 14 fully adult females are preceded by figures in parenthesis giving the measurements of the largest adult male. Head and body, (76), 77–87; hind foot, (18), 15–19; ear, (19), 19–21; forearm, (58.4, of another male, in alcohol, 60.2), 56.9–62.7,

of another female, in alcohol, 63.7; third metacarpal, (56.0), 51.4–55.9; greatest length of skull, to front of incisor, (24.2), 23.4–24.9; zygomatic breadth, (12.2), 11.7–12.6; mastoid width, (12.4), 11.9–13.0; interorbital constriction, (5.4), 5.3–5.8; height of brain case, from basisphenoid, (11.4), 11.1–11.9; upper tooth row, (5.7), 5.3–6.1.

Remarks.—The males are appreciably smaller than the females of comparable ages.

DIPHYLLA ECAUDATA Spix

Diphylla ecaudata SPIX, Simiarum et vespertilionum Brasiliensium species novae, p. 68, pl. 36, fig. 7, 1823.—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 87, 1900 (Cacagualito).

Type locality.—Brazil.

THYROPTERA TRICOLOR ALBIGULA G. M. Allen

Thyroptera tricolor, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 94, 1900 (Cacagualito).

Thyroptera tricolor albigula G. M. ALLEN, Proc. New England Zool. Club, vol. 9, p. 1, 1923.

Thyroptera albiventer, G. M. ALLEN and BARBOUR, Bull. Mus. Comp. Zool., vol. 65, p. 271, 1923 (Río Jesusito, eastern Panamá).—G. M. ALLEN, Proc. New England Zool. Club, vol. 9, p. 2, 1923 (*albiventer* distinct from *tricolor*!).—DUNN, Journ. Mamm., vol. 12, p. 429, 1931 (Barro Colorado Island, Canal Zone, Panamá).

Thyroptera tricolor albiventer, DUNN (*nec* Tomes), Journ. Mamm., vol. 12, p. 430, 1931 (Gutierrez, the type specimens of *albigula*; name *lapsus calami* for *Thyroptera tricolor albigula* Allen).

Type locality.—Gutierrez, in the mountains about 25 miles inland from Chiriquito, on the trail from the Chiriquí Lagoon to Boquete, western Panamá; altitude, approximately 4,000 feet.

Specimens collected. Eighteen. Colonia Agrícola de Caracolicito, southern slope of the Sierra Nevada de Santa Marta, 7 males (2 in alcohol), 11 females (5 in alcohol).

Measurements.—Head and body, 39–49; tail, 29–31 (of 7 specimens in alcohol, 24–30; free portion of tail 4–8, or 15–28 percent of total length); hind foot, 6–7; ear, 12–13; forearm, 34.3–37.7; greatest length of skull, 14.4–15.1; condylobasal length, 13.4–14.0; zygomatic breadth, 7.1–7.6; width of brain case, 7.2–7.4; depth of brain case, including bullae and cochleae, 6.5–7.0; width of rostrum, 4.0–4.3; interorbital constriction, 2.6–2.9; maxillary tooth row, 5.6–6.0.

Remarks.—Individual variation in color of underparts and in other characters in the large series from northern Colombia, as well as from other regions, shows that specific distinction of *Hyonycteris albiventer* Tomes (Proc. Zool. Soc. London, 1856, p. 179) from *Thyroptera tricolor* Spix (Simiarum et Vespert. Brasil., p. 61, 1823) cannot be maintained as advocated by G. M. Allen (Bull. Mus. Comp. Zool., vol. 52, p. 42, 1908) and Cabrera (Trab. Mus. Nac. Cienc. Nat.,

Madrid, ser. zool., No. 31, p. 15, 1917). In *tricolor* (*albicenter*), underparts to lower lip are usually sharply contrasted white, sometimes with yellowish tinge on parts of belly and chest, and either yellow or brown on chin and throat; ears small, blackish; calcar with two cartilaginous projections extending into posterolateral border of uropatagium. In *discifera*, the only other known valid species of the genus, underparts are brown, slightly paler than upperparts; ears yellowish, larger than in *tricolor*; calcar with one cartilaginous projection extending into posterolateral border of uropatagium; brain case lower, less globate, teeth smaller than in *tricolor*. Depth of brain case from auditory meatus in the type specimen of *T. discifera major* Miller is 6.5 mm. This form has been recorded by Sanborn (Ann. Carnegie Mus., vol. 21, p. 180, 1932) from Río Negro, Boyacá, in the interior of Colombia. A skull only, "probably from Bonda," is referred to *T. discifera major* by the same author (*loc. cit.*).

MYOTIS NIGRICANS NIGRICANS Schinz

Vesp[ertilio] nigricans SCHINZ ("P. Max."), Das Thierreich, vol. 1, p. 179, 1821.
Myotis nigricans, BANGS, Proc. New England Zool. Club, vol. 1, p. 102, 1900 (Santa Marta; Palomino).—ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 94, 1900 (Bonda).

Myotis bondae ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 33, p. 384, 1914 (Bonda, type locality).

Myotis nigricans nigricans, MILLER and ALLEN, U. S. Nat. Mus. Bull. 144, p. 177, 1928 (Bonda; Palomino; Santa Marta; revision).—SANBORN, Ann. Carnegie Mus., vol. 21, p. 180, 1932 (Aguachica).

Type locality.—Fazenda de Aga, near Rio Iritiba, Espirito Santo, Brazil (see Wied-Neuwied, Beiträge Naturg. Brasil., vol. 2, p. 268, 1826).

Specimens collected.—Twenty-four. Norosí, Bolívar, 10 males (in alcohol), 5 females (in alcohol); La Gloria, Río Magdalena, 5 males (in alcohol), 4 females (in alcohol).

EPTESICUS BRASILIENSIS ANDINUS Allen

Eptesicus andinus ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 33, p. 382, 1914.

Type locality.—Valle de Las Papas, Huila, Colombia; altitude, 10,000 feet.

Specimens collected.—One. Sierra Negra, Sierra de Perijá, 1 female.

Remarks.—The individual agrees specifically with a representative of true *brasiliensis* from Rio de Janeiro. Its forearm, 43.6 mm. in the dry skin, is slightly larger than that of the type of *andinus* Allen and slightly smaller than that of the type of *chiriquinus* Thomas. It is doubtful whether the latter can be separated even subspecifically from *andinus*. The more northern *propinquus* Peters is a smaller race of *brasiliensis*.

RHOGEESSA TUMIDA H. Allen

Rhogeessa tumida H. ALLEN, Proc. Acad. Nat. Sci. Philadelphia, 1866, p. 286.

Type locality.—Mirador, Veracruz, México.

Specimens collected.—Two. Colonia Agrícola de Caracolicito, 1 male (in alcohol); Río Guaimaral, 1 male.

Measurements.—Head and body, 39; tail, 29; hind foot, 7; ear, 11; forearm, 28.1 (of the male in alcohol, 28.3).

Remarks.—The skull of the specimen prepared as a skin has been lost. The type and a topotype of *R. minutilla* Miller, from Margarita Island, Venezuela, are smaller and paler but appear to be only sub-specifically distinct from *tumida*. Judged by the original description, *R. io* Thomas, from Valencia, Venezuela, is questionably separable even as a subspecies, from typical *tumida*.

LASIURUS CINEREUS PALLESCENS Peters

Atalapha pallescens PETERS, Monatsb. Akad. Wiss. Berlin, 1870, p. 910.

Lasiurus pallescens, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 94, 1900 (Bonda).

Type locality.—Sierra de Mérida, Venezuela.

CYNOMOPS PLANIROSTRIS PLANIROSTRIS Peters

Molossus planirostris PETERS, Monatsb. Akad. Wiss. Berlin, 1865, p. 575 footnote.

Cynomops planirostris paranus, SANBORN (*nec* Thomas), Publ. Field Mus. Nat. Hist., zool. ser., vol. 27, p. 386, 1941 (Cúcuta, Norte de Santander).

Type locality.—British Guiana (restricted by Miller, U. S. Nat. Mus. Bull. 79, p. 399, 1912).

TADARIDA MOLOSSA Pallas

V[espertilio] *Molossus* PALLAS, Miscellanea zoologica, p. 49, 1767; *Spicilegia zoologica*, fasc. 3, p. 8, pl. 4, fig. 11 (skull), 1767.

Nyctinomus macrotis GRAY, Ann. Mag. Nat. Hist., vol. 4, p. 5, pl. 1, fig. 3, 1840 (type locality, Cuba).

Promops affinis ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 91, 1900 (type locality, "Taguaga"=Taganga).

Nyctinomus molossus, MILLER, Proc. U. S. Nat. Mus., vol. 46, p. 86 and footnote 4, 1913 (taxonomic history).

Tadarida macrotis, SHAMEL, Proc. U. S. Nat. Mus., vol. 78, p. 15, 1931 ("Taguaga"=Taganga; *Promops affinis* Allen, a synonym; revision).—SANBORN, Ann. Carnegie Mus., vol. 21, p. 182, 1932 ("Taguaga"=Taganga).

Type locality.—"America"; according to Miller (*op. cit.*), "not improbably from Surinam."

Remarks.—Miller's statement (evidently overlooked by Shamel, *op. cit.*) that "the name *Nyctinomus molossus* (Pallas) should be applied to the '*macrotis*' of northern South America" is correct. As Shamel combines the northern South American and Antillean bats under the name *macrotis*, the prior name *molossa* is used here. Presumably the name *T. molossa* must apply also to Shamel's "*macrotis*"

recorded (*op. cit.*, p. 16) from "Mexico, Arizona, California, and Iowa," as well as from the other localities he listed.

EUMOPS ABRASUS MILLERI Allen

Promops milleri ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 92, 1900.

Eumops abrasus milleri, SANBORN, Ann. Carnegie Mus., vol. 21, p. 182, 1932 (Don Diego).—SANBORN, Journ. Mamm., vol. 13, p. 352, 1932 (Don Diego; revision).

Type locality.—Guayabamba (=Santa Rosa de Huayabamba), San Martín, Peru.

Specimens collected.—Three. Norosí, Bolívar, 3 females.

Measurements.—Head and body, 80, 82, 78; tail, 46, 46, 48; hind foot, 13, 13, 14; ear, 22, 22, 22; forearm, 57.2, 59.4, 60.6; greatest length of skull, —, 24.6, 23.6; condylobasal length, —, 22.4, 22.6; interorbital constriction, 4.6, 4.4, 4.3; width of brain case, —, 10.8, 10.7; upper tooth row (I – M³), 10.1, 10.6, 9.8; distance across canines, 6.0, 6.0, 5.5; distance across third upper molars. 9.7, 9.6, 9.4.

EUMOPS GLAUCINUS Wagner

Dysopes glaucinus WAGNER, Wiegmann's Arch. Naturg., Jahrg. 9, vol. 1, p. 368, 1843.

Promops glaucinus, ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 20, p. 457, 1904 (Santa Marta).

Eumops glaucinus, SANBORN, Journ. Mamm., vol. 13, p. 353, 1932 (Santa Marta; revision).

Type locality.—Cuyabá, Matto Grosso, Brazil.

MOLOSSUS MAJOR MAJOR Kerr

[*Urospeltio*] *Mol[ossus] major* KERR, Animal Kingdom, p. 97, 1792.

Molossus major, MILLER, Proc. U. S. Nat. Mus., vol. 46, pp. 85–86, 90, 1913 (Dominica, Trinidad, Venezuela).

[?] *Molossus crassicaudatus*, SANBORN (*nec* Geoffroy), Ann. Carnegie Mus., vol. 21, p. 183, 1932 (Jaraquiel; El Tambor, Santander).

Type locality.—La Martinique, Lesser Antilles, West Indies.

Specimens collected.—Eight. Aguas Blancas, near Valencia, 2 males, 6 females (1 in alcohol).

Measurements.—Head and body, 58–63; tail, 36–40; hind foot, 9–11; ear, 9–14; forearm, 36.8–38.7; greatest length of skull, 16.4–17.8; zygomatic breadth, 9.6–10.6; width of brain case, 8.7–8.8; maxillary tooth row (C–M³), 6.0–6.4; distance across upper canines, 4.2–4.6.

Remarks.—In his revision of the genus *Molossus*, Miller (*op. cit.*) found it expedient to treat as separate species all named forms recognizably distinct. These were arranged into species groups according to size. The *rufus* group included the large members of the genus with greatest breadth across the upper canines 5 mm. or more. The smaller species, with greatest breadth across the canines less than 5 mm., were subdivided into the *currentium*, the *pygmaeus*,

and the *obscurus* groups. Small and overlapping size differences combined with minor color differences were indicated for distinguishing each of these three divisions of small species. Additional material shows that the variation in size and color among these small species with distance across canines less than 5 mm. is even greater than had been supposed by Miller. Differences in color, especially, appear to represent nothing more than tonal variations in the light and dark phases of the same species. Sanborn (*op. cit.*) found, in agreement with earlier authors, that *currentium* and *obscurus* are conspecific. This conclusion combines, in effect, Miller's three groups of small molossids. The present series from northern Colombia shows extremes in cranial and external measurements that grade into the larger *obscurus* on the one hand and the smaller *pygmaeus* on the other. The series averages larger in size than insular forms of *major*, the oldest name available for most of the members of Miller's groups of small forms. As Miller records specimens of *major* from Venezuela with which the present series agrees, this may be the name adopted for the small northern Colombian *Molossus*. Further comparisons of the northern Colombian bats show them to be practically indistinguishable from pale phase individuals from Ecuador (Guayaquil and Santa Rosa) and northwestern Peru (Piura) indentified by Miller (*op. cit.*, p. 92) as *pygmaeus*. Apparently a smiliar bat from the same region was described later by Allen as *M. daulensis*. It appears that in addition to *obscurus*, *pygmaeus*, *currentium*, and *crassicaudatus* the specific synonyms of *major* may include *daulensis*, *coibensis*, and *aztecus*. Pending a revision of the genus, these names should be conserved, at least provisionally, as subspecies of *Molossus major*. The width of the brain case given for the type of *M. burnsi* Thomas does not now appear to be too excessive for the group. *M. bondae* Allen, regarded by Miller as one of the small groups of *Molossus*, was first described as larger than any of them.

MOLOSSUS BONDAE Allen

Molossus bondae ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 20, p. 28, 1904.—
MILLER, Proc. U. S. Nat. Mus., vol. 46, p. 89, 1913 (revision, no Colombian specimens examined).

Type locality.—Bonda, Río Manzanares, 7 miles east of Santa Marta, Magdalena, Colombia.

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NEW SPECIES AND RECORDS OF STAPHYLINID BEETLES FROM FORMOSA, JAPAN, AND SOUTH CHINA

By MALCOLM CAMERON

A COLLECTION of 950 specimens of beetles belonging to the family Staphylinidae from Hainan Island, southeast China, Formosa, the Loochoo Islands, and Japan has been turned over to me for report by Dr. R. E. Blackwelder, of the United States National Museum. These specimens were collected during several trips from 1932 to 1935 by Dr. J. Linsley Gressitt, now of Lingnan University.

Two new genera, 22 new species, 1 new variety, and many new records are included. Unless otherwise noted all specimens were collected by Dr. Gressitt. Holotypes are in the United States National Museum except as noted; paratypes of all new species are in my collection; and paratypes of most of the new species are also in the Gressitt Collection in the California Academy of Sciences. Dates are abbreviated, as, for example, V-7-32=May 7, 1932.

1. EUPIESTUS CHINENSIS, new species

Shining; head and thorax black, elytra and abdomen pitchy, the posterior margins of the tergites rufescent. Antennae black, the first four segments reddish. Legs reddish yellow. Of the size of *sculpticollis* Kraatz but narrower, the interantennal fossae smaller, thorax narrower and less transverse. Head subtriangular, with two large fossae anteriorly and one at the middle of the base, and at the inner margin of the eye with a sulcus; with small rather close punctures larger than in *sculpticollis*. Antennae as in *sculpticollis*, the second and third segments of equal length, the fourth to tenth transverse. Thorax very slightly broader than long, the sides in front practically parallel, posteriorly strongly arcuately constricted, with eight fossae as in *sculpticollis* more coarsely punctured than in that species. Elytra

a little longer and broader than the thorax, tricarinate, and with elevated sutural region, the sulci closely and moderately coarsely punctured. Abdomen rather closely punctured throughout, the punctures finer posteriorly. Length, 2.5 mm.

Type locality.—China, Hainan Island, Chung Kow.

Types.—Holotype, U.S.N.M. No. 58732; one paratype in my collection; collected VII-18-35.

2. **SIAGONIUM VITTATUM** Fauvel

Localities.—Japan, Tokyo (February and April 1931), Mitake (III-5-32); Formosa, Arisan (VI-4-32, V-25-34).

3. **PIESTONEUS LEWISI** Sharp

Localities.—Japan, Nikko (VII-28-32).

4. **PIESTONEUS** sp.

Localities.—Japan, Nikko (VII-28-32).

5. **ELEUSIS KRAATZI** Fauvel

Localities.—Formosa, Karenko (IV-23-32).

6. **ELEUSIS PUSILLA** Fauvel

Localities.—China, Hainan Island, Chung Kon (VII-18-35).

7. **ELEUSIS** sp.

Localities.—Formosa, Shikikun (V-11-32).

8. **ELEUSIS** sp.

Localities.—Formosa, Arisan (VI-4-32).

9. **BOROLINUS MINUTUS** Castelnau

Localities.—China, Hainan Island, Chung Kon (VI-18-35).

10. **LEPTOCHIRUS (STRONGYLOCHIRUS) LAEVIS** Castelnau

Localities.—China, Hainan Island, Chung Kon (VII-18-35), Dwa Bi (VII-23-35).

11. **PRIOCHIRUS (TRIACANTHOCHIRUS) TONKINENSIS** Bernhauer

Localities.—Formosa, Suisha (V-29-32), Urai (IV-1-32, V-3-32), Chipon (IV-18-32), Musha (V-20-32), Karenko (IV-23-32), Riran (IV-19-32), Hassenzan (IV-22-34), Hori (VI-6-34), Rokki (V-13-34); China, Hainan Island, Dwa Bi (VII-28-35).

12. **PRIOCHIRUS (CEPHALOMERUS) JAPONICUS** Sharp

Localities.—Formosa, Arisan (June 1932, May 1934), Hassenzan (VI-21-32, April 1934), Pianan Ambu (V-12-32), Taiheizan (V-7-32), Musha (V-20-32).

13. **PRIOCHIRUS (CEPHALOMERUS) EXCAVATUS** Motschulsky

Localities.—Formosa, Musha (V-20-32).

14. **PRIOCHIRUS (CEPHALOMERUS) SILVESTRII** Bernhauer
RUFIPENNIS, new variety

Differs from the type form only in the dark red color of the elytra.

Type locality.—Formosa, Arisan.

Types.—Holotype and 63 paratypes, U.S.N.M. No. 58940; 2 paratypes in my collection; 6 paratypes in Gressitt collection in the California Academy of Sciences (C.A.S. No. 5949).

Localities.—Formosa, Arisan (VI-2-32, VI-8-32, V-25-34), Musha (V-20-32), Taiheizan (V-6-32), Hassenzan (VI-21-32).

15. **PRIOCHIRUS (PLASTUS) sp.**

Localities.—Formosa, Urai (IV-2-32), Shinten (IV-3-32).

16. **THORACOCHIRUS FORMOSAE** Cameron

Localities.—Formosa, Hassenzan (VI-21-32).

17. **PARALISPINUS EXIGUUS** Erichson

Localities.—Formosa, Karenko (IV-23-32).

18. **PSEUDOLISPINODES PUNCTICOLLIS** Bernhauer

Localities.—China, Hainan Island, Chung Kon (VII-18-35).

19. **HOLOSUS DENSUS** Bernhauer

Localities.—Formosa, Arisan (VI-6-32, V-25-34).

20. **HOLOSUS SPARSIPENNIS**, new species

Very like *formosae* Cameron but a little narrower, the punctures of the head a little smaller, the ground sculpture, however, similar. Thorax of the same build but with the lateral fossae smaller and much less deep, the punctures about as close but much finer, the ground sculpture finer; elytra extremely finely, sparingly punctured, otherwise like *formosae*. Abdomen with the oblique striae weaker. Length, 3 mm.

Type locality.—Formosa, Karenko.

Types.—Holotype and one paratype, U. S. N. M. No. 58731; one paratype in my collection; and one paratype in the Gressitt collection in the California Academy of Sciences (C. A. S. No. 5948).

Records.—Formosa, Karenko (IV-23-32), Urai (IV-1-32).

21. **HOLOSUS FORMOSAE**, new species

Shining black, the last tergite red. Antennae red. Legs reddish yellow. Elongate, subparallel, in general facies much like *brevipennis* Fauvel, but with less transverse thorax and longer elytra. Head

rather finely and closely punctured, finely coriaceous. Antennae extending to the posterior angles of thorax, the penultimate segments distinctly transverse. Thorax transverse (3:2.3), the sides straight, almost parallel, only slightly narrower behind than in front; the anterior angles prominent, pointed; median sulcus and prebasal impressions absent, the lateral fossa large and deep, the sculpture as on the head. Elytra slightly longer and broader than the thorax (3:2.3), broader than long (3.5:3), the sides gently rounded, the sutural stria rather broad, the puncturation much like that of the thorax but ground sculpture absent. Abdomen slightly narrowed posteriorly, the first five visible tergites finely obliquely striate and very finely and sparingly punctured, finely coriaceous. Length, 3.5 mm.

Type locality.—Formosa, Musha.

Types.—Holotype and three paratypes, U.S.N.M. No. 58730; one paratype in my collection and one in the Gressitt collection in the California Academy of Sciences.

Records.—Musha (V-20-32), Urai (IV-1-32), Rokki (V-13-34), Hori (VI-8-34).

22. HOLOSUS sp.

Localities.—Formosa, Kuraru (VIII-10-34).

23. LISPINUS ROBUSTICOLLIS Bernhauer

Localities.—Formosa, Kuraru (IV-6-32), Karenko (IV-23-32).

24. LISPINUS LONGULUS Sharp

Localities.—Japan, Yokohama (IV-6-31).

25. LISPINUS FORMOSAE Bernhauer

Localities.—Formosa, Suisha (V-29-32), Karenko (IV-23-32), Riran (IV-19-32), Chipon (IV-18-32), Urai (IV-1-32), Kuraru (IV-6-32), Hori (VI-6-34), Rokki (V-13-34).

26. LISPINUS FORMOSANUS, new species (Bernhauer in litt.)

Narrow elongate shining black, the last tergite reddish. Antennae red. Legs reddish yellow. Of the narrow elongate build of *elongatus* Bernhauer but with longer antennae and different abdominal sculpture. Head narrower than thorax, broadly superficially bi-impressed between the antennae, rather closely, moderately coarsely punctured posteriorly, the punctures larger than in *elongatus*, less closely in front, the ground sculpture fine, more or less longitudinally striate. Antennae with the third segment longer than second, fourth to tenth all longer than broad, gradually decreasing in length, the penultimate only slightly longer. Thorax very slightly broader than long (2.5:2.3), the sides feebly rounded, straight and retracted behind, along the middle with an extremely fine impressed line, at the posterior angle

with a lateral impression almost reaching the middle of the side, the punctures as close but longer than in *elongatus*, the ground sculpture longitudinally striate. Elytra longer (3.5:2.3) than the thorax, the punctures not so large as on the thorax (coarser than in *elongatus*), the ground sculpture similar. Abdomen elongate, the first visible tergite rather closely punctured, the second to fifth with numerous more or less oblique fine ridges and irregular puncturation; ground sculpture coriaceous. Length, 6 mm.

Type locality.—Formosa, Taihorin.

Types.—Holotype in my collection, collected by H. Sauter; two paratypes, U.S.N.M. No. 58941.

Records.—Formosa, Taihorin, Urai (IV-1-32, V-1-32); Kuraru (IV-7-32).

27. *LISPINUS ISOLATUS*, new species

Shining; foreparts red, the head more or less infusate, abdomen pitchy, the posterior margins of the first five visible tergites and whole of the last rufescent. Antennae red. Legs reddish yellow. In color and lustre much like *luzonicus* Bernhauer but a little larger, the antennae longer, the thorax longer and less transverse, more punctured and with stronger ground sculpture, the punctures and ground sculpture of the elytra stronger. Head with small scattered punctures, the ground sculpture distinct, coriaceous. Antennae with the third segment as long as the second, fourth and fifth orbicular, sixth to tenth transverse, differing but little. Thorax transverse (4:3), the sides rounded in front, arcuately retracted behind, feebly bi-impressed at the middle of the base and with a short impression at the posterior angle, narrowly impunctate along the middle and sometimes with a very fine impressed line; punctures as on the head but rather closer, between the median and lateral impressions with an impunctate area; the ground sculpture as on the head. Elytra longer (4.5:3) than the thorax, the punctures very similar but less close, the ground sculpture similar. Abdomen more strongly coriaceous, very sparingly punctured. Length, 3 mm.

Type locality.—Formosa, Kuraru.

Types.—Holotype and one paratype, U.S.N.M. No. 58729; one paratype in my collection; one in the Gressitt collection in the California Academy of Sciences (C. A. S. No. 5950).

Records.—Formosa, Kuraru (IV-6-32), Musha (V-20-32).

28. *LISPINUS* sp.

Localities.—Loochoo Islands, Amami-Oshima (VII-9-31).

29. *THORACOPHORUS* sp.

Localities.—Formosa, Chipon (IV-18-32).

30. MEGARTHUS JAPONICUS Sharp

Localities.—Japan, Tokyo (III-20-31, IV-14-31).

31. ANTHOBIUM SOLITARE Sharp

Localities.—Formosa, Taihoku (III-27-32), Sozan (III-29-32), Musha (V-20-32).

32. ANTHOBIUM (EUSPHALERUM) FORMOSAE, new species

Shining; head and thorax red, elytra reddish yellow, abdomen pitchy, the last tergite yellowish. Antennae red, the penultimate segments often infusate. Legs reddish yellow. Length, 2 mm. Of the size and color of *solitare* Sharp, but the thorax less transverse, much less finely punctured and with scarcely visible ground sculpture, the antennae longer, the penultimate segments longer than broad. Head moderately finely, closely punctured, before the ocelli with a feeble impression, ground sculpture coriaceous, feeble. Antennae slender, the penultimate segments a little longer than broad. Thorax transverse (2.5:2), closely punctured like the head and with similar ground sculpture. Elytra twice as long as the thorax, as closely but less finely punctured and without ground sculpture. Abdomen finely, rather closely punctured, not entirely covered by the elytra in either sex. Pubescence throughout fine and yellow. Length, 2 mm.

Type locality.—Formosa, Taiheizan.

Types.—Holotypes and 32 paratypes, U.S.N.M. No. 58728; 4 paratypes in my collection; 4 paratypes in Gressitt collection in the California Academy of Sciences (C. A. S. No. 5951).

Records.—Formosa, Taiheizan (V-6-32 to V-10-32), Arisan (VI-5-32, VI-6-32), Musha (V-20-32), Pianan Ambu (V-11-32).

33. PHYLLODREPA sp.

Localities.—Japan, Tokyo (III-20-31).

34. OMALIUM CURTELLUM Sharp

Localities.—Japan, Tokyo (V-13-31).

35. OMALIUM sp.

Localities.—Formosa, Arisan (V-25-34).

36. LESTEVA PLAGIATA Sharp

Localities.—Japan, Tokyo (V-20-31).

37. TROGOPHLOEUS BIIMPRESSUS Cameron

Localities.—Japan, Tokyo (Sept. 1931).

38. TROGOPHLOEUS SHARPIANUS Cameron

Localities.—Japan, Tokyo (X-5-31).

39. *TROGOPHLOEUS SIAMENSIS* Fauvel

Localities.—Japan, Tokyo (Nov. 1931).

40. *TROGOPHLOEUS VAGUS* Sharp

Localities.—Formosa, Kuraru (VIII-10-34).

41. *TROGOPHLOEUS* sp.

Localities.—Japan, Tokyo (III-26-31).

42. *OXYTELUS COGNATUS* Sharp

Localities.—Japan, Yamanashi (IV-4-31), Tokyo (III-20-31, IV-28-31, V-1-31, VI-22-31).

43. *OXYTELUS CRASSICORNIS* Sharp

Localities.—Japan, Tokyo (IV-22-31).

44. *OXYTELUS GREGARIUS* Sharp

Localities.—Formosa, Sakahen (VII-36-34).

45. *OXYTELUS LUCENS* Bernhauer var.

Localities.—Formosa, Urai (V-3-32), Taiheizan (V-8-32), Kar-enko (IV-23-32), Hassenzan (VI-21-32).

46. *OXYTELUS MIMULUS* Sharp

Localities.—Japan, Mitake (III-5-32).

47. *OXYTELUS OPACIFRONS* Sharp

Localities.—Japan, Tokyo (Nov. 1931, VIII-27-32).

48. *OXYTELUS PICEUS* Linnaeus

Localities.—Japan, Tokyo (VII-7-31, Sept. 1931).

49. *OXYTELUS VICINUS* Sharp

Localities.—Japan, Tokyo (III-24-31).

50. *OXYTELUS* sp.

Localities.—Formosa, Musha (V-20-32).

51. *PLATYSTETHUS OPEROSUS* Sharp

Localities.—Japan, Tokyo (III-21-31).

52. *BLEDIUS GIGANTULUS* Bernhauer

Localities.—Japan, Tokyo (VII-7-31, IX-11-31, X-5-30, Nov. 1931).

53. *BLEDIUS KOSEMPOENSIS* Bernhauer

Localities.—Formosa, Rokki (V-15-34, VI-14-32), Tamazato (IV-20-32).

54. *BLEDIUS LUCIDUS* Sharp

Localities.—Japan, Tokyo (IV-28-31, V-20-31, VII-7-31, Sept. 1931).

55. *OSORIUS FORMOSAE* Bernhauer

Localities.—Formosa, Arisan (VI-4-32, V-25-29, V-26-34), Musha (V-21-32), Urai (IV-2-32), Taiheizan (V-8-32).

56. *OSORIUS MORTUORUM* Bernhauer

Localities.—Formosa, Urai (V-1-32).

57. *OSORIUS TONKINENSIS* Bernhauer

Localities.—Formosa, Urai (V-2-32), Taroko (IV-24-32), Karenko (IV-23-32).

58. *OSORIUS RUFIPES* Motschulsky

Localities.—Formosa, Taiheizan (V-6-32).

59. *STENUS ALIENUS* Sharp

Localities.—Japan, Yokohama (III-28-31), Tokyo (III-16-31, XI-26-31).

60. *STENUS LEWISIUS* Sharp

Localities.—Japan, Tokyo (IV-16-31, III-23-31).

61. *STENUS VERECUNDUS* Sharp

Localities.—Formosa, Musha (V-21-32).

62. *STENUS* sp.

Localities.—Japan, Tokyo (XI-5-30).

63. *STENUS* sp.

Localities.—Formosa, Hori (VI-6-34).

64. *STENUS* sp.

Localities.—China, Hainan Island, Ta Hau (VII-3-35).

65. *STENUS* sp.

Localities.—Loochoo Islands, Amami-Oshima (VII-11-32).

66. *STENUS (HEMISTENUS) ARISANUS*, new species

Shining black, the elytra with rather large oval orange-red spot postero-externally. Antennae, palpi, and legs reddish yellow. Larger and more shining than *kwantungensis* the elytra longer and uneven, the orange spot larger, more coarsely punctured. Head as broad as the base of elytra, lightly bi-impressed, closely coarsely rugosely punctured. Antennae extending to base of elytra, the penultimate segments slightly longer than broad. Thorax longer than broad

(3:2.5), widest at the middle, straightly retracted behind, the puncturation as on the head; ground sculpture feeble. Elytra longer than the thorax (4:3), as long as broad, uneven, with similar puncturation and ground sculpture. Abdomen gradually narrowed to apex, distinctly margined, the puncturation close, less coarse than on the elytra, the ground sculpture similar. Male, fifth sternite broadly impressed on the middle of the posterior half, the posterior margin of the impression slightly emarginate, the pubescence scarcely thicker than on the rest of the surface; sixth rather deeply, triangularly emarginate. Length, 4.5 mm.

Type locality.—Formosa, Arisan.

Types.—Holotype, U.S.N.M. No. 58735; one paratype in my collection; both collected V-25-34.

67. *STENUS (HEMISTENUS) KWANTUNGENSIS*, new species

Black, moderately shining, the elytra with a small obscure oval orange-red spot postero-externally and about equidistant from the lateral and posterior margins, farther from the suture. Antennae reddish yellow, infusate apically. Legs and palpi reddish yellow. In size and build very like *alienus* Sharp but with different tarsal structure, less shining, the elytral spot larger, oval, equally obscure, sculpture of the foreparts coarser, that of the abdomen finer. Head as broad as the base of elytra, feebly broadly bi-impressed, only slightly elevated in the middle, closely and moderately coarsely punctured. Antennae slender, extending to the base of the elytra, the eighth to tenth segments only slightly longer than broad. Thorax longer than broad (3:2.5) widest at the middle, the sides arcuately retracted behind, rounded in front, at the sides very obscurely impressed and without median sulcus, coarsely rugosely punctured. Elytra as long as the thorax, broader than long (3.5:3), the sculpture similar. Abdomen gradually narrowed toward apex, distinctly margined, closely and moderately finely punctured throughout. Male, fifth sternite broadly impressed along the middle, the impression deeper behind and closely pubescent; sixth arcuately emarginate. Length, 3.5-4 mm.

Type locality.—South China, eastern Kwantung, Yim Na San.

Types.—Holotype and 4 paratypes, U.S.N.M. No. 58734; one paratype in my collection; one paratype in Gressitt Collection in California Academy of Sciences (C. A. S. No. 5952). Collected VI-15-36.

68. *STENUS (HEMISTENUS) RUGOSIPENNIS*, new species

Black, rather shining. Antennae reddish. Palpi and legs reddish yellow. The knees more or less infusate. Head as broad as the base of the lytra, distinctly bisulcate, closely and coarsely punctured,

the raised median part yet more so. Antennae long and slender extending to the base of the elytra, all the segments longer than broad. Thorax as long as broad, widest at the middle, the sides gently rounded in front, straighter and more retracted behind, with median more shining sulcus not extending to the anterior or posterior borders, the sculpture coarse rugose and vermicular. Elytra longer than the thorax (4.5:3.2), broader than long (5:4.5), uneven, with coarse close vermicular rugae forming a rosette. Abdomen elongate and cylindrical as in *Hypostenus*, but the segments finely margined, rather coarsely and closely punctured on the first two visible tergites more finely on the following with fine coriaceous ground sculpture and fine pubescence. Foreparts without ground sculpture or pubescence. Male, second to fourth sternites broadly flattened along the middle; fifth broadly and deeply impressed on the posterior half; sixth with rectangular emargination of the posterior margin. Length, 6 mm.

Type locality.—Formosa, Arisan.

Types.—Holotype and one paratype, U.S.N.M. No. 58736; one paratype in my collection; VI-4-32.

69. *STENUS* (*HEMISTENUS*) *SHARPIANUS* Cameron

Localities.—Japan, Tokyo (XI-5-30); Formosa, Musha (V-20-32), Arisan (V-25-34).

70. *STENUS* (*HEMISTENUS*) sp.

Localities.—Formosa, Arisan (VI-4-32).

71. *STENUS* (*HYPOSTENUS*) *SUBTROPICUS*, new species

Shining black. Antennae and legs reddish yellow. Much like *tropicus* Bernhauer in build but with narrow head, longer entirely testaceous antennae, and less coarse puncturation throughout. Head as broad as the base of elytra, the eyes large, the disc flat, closely and coarsely punctured. Antennae extending to the base of the thorax, all the segments longer than broad. Thorax slightly longer than broad (2.5:2.3), the sides feebly rounded, broader about the middle, coarsely and closely punctured like the head. Elytra broader and a little longer than the thorax, broader than long (3.5:3), the puncturation similar. Abdomen cylindrical, only the first visible tergite margined, closely, moderately coarsely punctured on the first three visible segments, more finely on the following, the puncturation much less coarse than in *tropicus*. Ground sculpture absent on the foreparts, very feeble on the abdomen. Pubescence white and corresponding with the punctures on the foreparts, closer at the bases of the first three visible tergites. Male, first sternite with a fine keel along the middle of the basal half; second and third deeply broadly crescentically impressed, the margins of the impressions raised and produced backward, densely pubescent; fourth with a large simple pubescent impression at the

base; sixth deeply triangularly emarginate. The structure of the third sternite is very like that of the corresponding one in *praenobilis* Bernhauer. Length, 4 mm.

Type locality.—China, Hainan Island, Ta Hau.

Types.—Holotype, U.S.N.M. No. 58733; one paratype in my collection; both collected VII-7-35.

72. *STENUS (HYPOSTENUS)* sp.

Localities.—Formosa, Urai (V-1-32).

73. *STENUS (HYPOSTENUS)* sp.

Localities.—Formosa, Rokki (VI-16-32).

74. *DIANOUS* sp.

Localities.—Formosa, Taiheizan (V-6-32).

75. *PALAMINUS JAPONICUS* Cameron

Localities.—Formosa, Hassenzan (IV-22-34, VI-22-32), Suisharyo (VI-10-32), Rokki (V-13-34), Bukai (VI-13-34), Suisha (VI-1-34), Hori (VI-6-34).

76. *PALAMINUS FORMOSAE*, new species

Of the usual shining reddish-yellow color of *japonicus* Cameron but larger (4.5 to 5.5 mm with normally extended abdomen) and more robust, the antennae longer and stouter, thorax broader, more transverse (3:2.5). Elytra a half longer than the thorax. Differs from *pennifer* Fauvel in the longer antennae, more transverse thorax less retracted behind, and with more numerous punctures; in other respects similar.

Type locality.—Formosa, Bukai.

Types.—Holotypes and 11 paratypes, U.S.N.M. No. 58737; two paratypes in my collection; two paratypes in the Gressitt collection in the California Academy of Sciences (C. A. S. No. 5953).

Records.—Formosa, Bukai, Rokki (V-13-34 to V-20-34), Hassenzan (IV-22-34 to IV-27-34), Hori, Suisha. Loochoo Islands, Amami-Oshima (VII-10-32).

77. *PALAMINUS* sp.

Localities.—China, southwest Fukien, Liung Chon San (VII-21-36).

78. *PALAMINUS* sp.

Localities.—China, southwest Fukien, Tsin Leong San (VI-6-36).

79. *PALAMINUS* sp.

Localities.—Formosa, Hori (VI-8-34).

80. *PALAMINUS* sp.

Localities.—China, Hainan Island, Ta Han (VI-21-35).

81. *PAEDERUS ANGUSTIPENNIS* Bernhauer

Localities.—Japan, Nikko (VII-19-31, VII-26-32).

82. *PAEDERUS FLAVOTERMINATUS*, new species

Moderately shining, head and abdomen black, the last tergite and sixth sternite yellow, thorax red, elytra dark blue to black. Antennae and palpi yellowish red. Femora black, tibiae and tarsi reddish yellow. Similar in build and antennal structure to *poweri* Sharp but at once distinguished by the red thorax, the more or less yellow eighth tergite, the entirely yellow sixth sternite, and the fine coriaceous ground sculpture of the head and thorax; from *formosanus* Adachi in which a fine coriaceous ground sculpture is present on the head and thorax it differs in the color of the latter; from *kosempoensis* Bernhauer it differs in the broader, more robust build and the yellow terminal segments of the abdomen and the fine ground sculpture of the head and thorax. Male sixth sternite with deep parallel-sided excision. Female, sixth sternite produced in middle, narrowed and rounded at apex. Length, 10-12 mm.

Type locality.—Formosa, Musha.

Types.—Holotype and 17 paratypes, U.S.N.M. No. 58738; 2 paratypes in my collection; 2 paratypes in the Gressitt collection in the California Academy of Sciences (C.A.S. No. 5954).

Records.—Formosa, Musha (V-20-32), Arisan (VI-4-32, V-25-34).

83. *PAEDERUS FORMOSANUS* Adachi

Localities.—Formosa, Pianan-Ampu (V-11-32), Taiheizan (VII-7-34), Hassenzan (IV-22-34).

84. *PAEDERUS FUSCIPES* Curtis

Localities.—Japan, Tokyo (VI-6-32, V-13-31, Sept. 1930, IV-28-31, V-23-30); Loochoo Islands, Okinawa (VII-5-32); Formosa, Rokki (VI-12-32, V-13-34), Suisha (VI-1-34), Choshu (IV-4-32); China, southwest Fukien, Tsin Leong San (VI-6-36).

85. *PAEDERUS KOSEMPOENSIS* Bernhauer

Localities.—Formosa, Rokki (V-13-34), Hassenzan (IV-22-34), Bukai (VI-13-34), Mizuho (IV-21-32), Musha (May 1, 1929).

86. *PAEDERUS MIXTUS* Sharp

Localities.—Formosa, Rokki (VI-12-32, V-13-34).

87. *PAEDERUS POWERI* Sharp

Localities.—Japan, Nikko (VII-23-32), Yamanashi (VI-27-31).

88. *PAEDERUS SONDAICUS* Fauvel

Localities.—Formosa, Chipon (IV-18-32), Riran (IV-19-32).

89. *PAEDERUS TAMULUS* Erichson

Localities.—Formosa, Mizuho (IV-21-32), Rokki (VI-14-32).

90. *DIBELONETES PALAEOTROPICUS* Bernhauer

Localities.—Formosa, Shonoryo (VI-11-32), Rokki (V-13-34), Hori (VI-8-34), Kuraru (VIII-10-34).

91. *ASTENUS* sp.

Localities.—Formosa, Hassenzan (IV-22-34).

92. *MEDON SUBMACULATUS* Sharp

Localities.—Formosa, Rokki (VI-14-32).

93. *LITHOCHARIS NIGRICEPS* Kraatz

Localities.—Japan, Tokyo (Sept. 1931).

94. *LITHOCHARIS UVIDA* Kraatz

Localities.—Japan, Tokyo (V-28-31).

95. *LATHROBIUM SERIATUM* Sharp

Localities.—Japan, Tokyo (IX-11-31).

96. *CRYPTOBIUM MARGINATUM* Motschulsky

Localities.—Formosa, Kuraru (IV-10-32).

97. *CRYPTOBIUM PECTORALE* Sharp

Localities.—Japan, Tokyo (Sept. 1931); Formosa, Rokki (VI-16-32).

98. *METOPONCUS* sp.

Localities.—Japan, Nikko (VII-28-32).

99. *XANTHOLINUS PLEURALIS* Sharp

Localities.—Japan, Mount Takao (III-18-31).

100. *XANTHOLINUS SUFFUSUS* Sharp

Localities.—Japan, Tokyo (May 1931).

101. *NEOBISNIUS PUMILUS* Sharp

Localities.—Japan, Tokyo (VI-15-31); Formosa, Rokki (VI-16-32).

102. *PHILONTHUS AENEIPENNIS* Boheman

Localities.—China, Hainan Island, Fan Ta (VI-4-35).

103. *PHILONTHUS AGILIS* Gravenhorst

Localities.—Japan, Tokyo (IV-8-31).

104. *PHILONTHUS LEWISIUS* Sharp

Localities.—Formosa, Rokki (VI-16-32, V-13-34); Japan, Tokyo (V-16-31).

105. *PHILONTHUS LONGICORNIS* Stephens

Localities.—Japan, Kyushu, Moji (VII-27-32, collected by T. Nakamura).

106. *PHILONTHUS QUISQUILIARIUS* Gyllenhal

Localities.—Japan, Tokyo (IV-30-30).

107. *PHILONTHUS RECTANGULUS* Sharp

Localities.—Japan, Tokyo (Nov. 1931).

108. *PHILONTHUS 7-PUNCTATUS* Cameron

Localities.—Formosa, Taiheizan (V-9-32).

109. *PHILONTHUS SOLIDUS* Sharp

Localities.—Japan, Tokyo (IV-14-31).

110. *PHILONTHUS* sp.

Localities.—Formosa, Arisan (V-25-34).

111. *PHILONTHUS* sp.

Localities.—Japan, Tokyo (XI-5-30).

112. *PHILONTHUS* sp.

Localities.—Formosa, Kuraru (IV-4-32).

113. *HESPERUS* sp.

Localities.—Formosa, Rokki (V-13-34).

114. *HESPERUS* sp.

Localities.—Formosa, Arisan (VI-5-32).

115. *AMICHROTUS APICIPENNIS* Sharp

Localities.—Japan, Nikko (VII-26-32).

116. *STAPHYLINUS PAGANUS* Sharp

Localities.—Japan, Tokyo (IV-20-30, X-20-30).

117. *STAPHYLINUS* sp.

Localities.—Formosa, Musha (V-21-32).

118. OCYPUS DORSALIS Sharp

Localities.—Japan, Kamikochi (VIII-4-31).

119. OCYPUS KOBENSIS Cameron

Localities.—Japan, Yokohama (V-15-30).

120. LEISTOTROPHUS GRACILIS Sharp

Localities.—Japan, L. Nojiri (VIII-7-31), Yamanashi (VI-27-31).

121. EUCIBDELUS JAPONICUS Sharp

Localities.—Japan, Sagashio, Yamanashi (VI-26-31), Tokyo (V-30-31), Nikko (VII-26-32).

122. EUCIBDELUS sp.

Localities.—China, southeast Kiangsi, Hong San (VI-26-36).

123. RHYNCOCHEILUS sp.

Localities.—Formosa, Taiheizan (VII-7-34).

124. ALGON GRANDICOLLIS Sharp

Localities.—Japan, Tokyo (V-29-31).

125. QUEDIUS JAPONICUS Sharp

Localities.—Japan, Tokyo (III-20-31).

126. QUEDIUS sp.

Localities.—Japan, Tokyo (V-13-31).

127. QUEDIUS sp.

Localities.—Formosa, Rokki (V-13-34).

128. MYCETOPORUS BOLITOBIOIDES Bernhauer

Localities.—Formosa, Arisan (VI-6-32).

129. CONOSOMA PARVULUM Cameron

Localities.—China, Hainan Island, Chung Kon (VII-18-35).

130. CONOSOMA PLAGIATUM Fauvel

Localities.—Formosa, Arisan (VI-4-32).

131. CONOSOMA TESTACEUM Erichson

Localities.—Formosa, Rokki (V-13-34).

132. CONOSOMA FORMOSANUM, new species

Moderately shining, black, the elytra at the base each with a small round orange-red spot, the posterior margins of the seventh and eighth

tergites yellowish. Antennae long and slender, the sixth to tenth segments infusate. Legs yellow. In coloration and sculpture scarcely differing from *bipustulatum* Gravenhorst and the antennae similarly constructed extending to the base of the elytra, but the thorax is distinctly longer and less transverse (5:4) than in that species and the elytral spot is much smaller. In all other respects similar. Length, 4 mm.

Type locality.—Formosa, Urai.

Types.—Holotype, U.S.N.M. No. 58739; one paratype in my collection; collected VI-26-32.

133. *CONOSOMA* sp.

Localities.—Formosa, Urai (V-2-32).

134. *TACHYPORUS FLAVOPICTUS* Fauvel var.

Localities.—Formosa, Taiheizan (V-10-32), Arisan (V-25-34).

135. *TACHINUS JAPONICUS* Sharp

Localities.—Japan, Nikko (VII-26-32), Taiheizan (V-5-32).

136. *COPROPORUS FORMOSAE* Bernhauer

Localities.—Formosa, Hassenzan (VI-21-32).

137. *COPROPORUS MELANARIUS* Erichson

Localities.—China, Hainan Island, Chung Kon (VII-18-35).

138. *COPROPORUS* sp.

Localities.—Formosa, Hori (VI-8-34).

139. *LEUCOCRASPEDUM DILUTUM* Bernhauer

Localities.—Formosa, Mizuho (IV-21-32).

140. *LEUCOCRASPEDUM PALLIDUM* Cameron

Localities.—Formosa, Hassenzan (IV-22-34).

141. *LEUCOCRASPEDUM PARVUM*, new species

Moderately shining reddish yellow, the elytra extensively infusate. Antennae reddish yellow, the eleventh segment infusate. Legs reddish yellow. Smaller than *dilutum* Bernhauer, the antennae more slender, the fourth segment longer than broad, the penultimate less transverse, the eleventh longer, as long as the three preceding together; thorax very finely but not so finely and obsoletely punctured as in that species. Pubescence throughout golden yellow. From *minutum* Bernhauer it differs in the color of the elytra and abdomen, longer thinner antennae, and less closely punctured abdomen. Length, 1.5 mm.

Type locality.—Loo Choo Islands, Amani-Oshima.

Types.—Holotype, U.S.N.M. No. 58740; one paratype in my collection; collected VII-11-32.

142. *LEUCOCRASPEDUM ROBUSTUM* Cameron

Localities.—Formosa, Mount Kannon (IV-28-32), Hassenzan (IV-22-34).

143. *LEUCOCRASPEDUM SCORPIO* Blackburn

Localities.—China, eastern Kwantung, Yin Na San (VI-15-36), Southwest Fukien, Liung Chon San (VII-21-36); Formosa, Musha (V-18-32).

144. *LEUCOCRASPEDUM* sp.

Localities.—Formosa, Bukai (VI-13-34).

NEODECUSA, new genus

In facies exactly like *Leucocraspedum* Kraatz but at once distinguished by the 10-segmented antennae and the short narrow tongue which is slightly longer than broad with parallel sides and rounded apex, the right mandible with only a single small tooth, the left edentate, in all other respects similar to that genus. From *Decusa* Casey it differs in the longer first segment of the posterior tarsus, which is as long as the second, third, and fourth together and the fifth much shorter than the first as in *Leucocraspedum*. The structure of the mouth parts in *Decusa* is unknown.

145. *NEODECUSA FORMOSAE*, new species

Moderately shining, head, thorax, and abdomen black or pitchy, elytra pitchy brown. Antennae and legs reddish yellow. In build and color resembling *Leucocraspedum scorio* Blackburn but slightly smaller, with longer antennae, the penultimate segments not transverse, the terminal segment longer, the puncturation of the head, thorax, and abdomen scarcely differs in the two species but that of the elytra distinctly finer. Antennae with first and second segments of equal length, the third segment a little shorter and more slender than second, fourth as long as broad, fifth as long as fourth but stouter, sixth to ninth as long as broad, gradually increasing in size, tenth in male as long as the five preceding together, in female as long as the three preceding together. Male, sixth sternite with feeble arcuate emargination. Length, 1.75—2 mm.

Type locality.—Formosa, Hassenzan.

Types.—Holotype and 22 paratypes, U. S. N. M. No. 58741; two paratypes in my collection; two paratypes in the Gressitt collection in the California Academy of Sciences (C. A. S. No. 5955).

Records.—Formosa, Hassenzan (IV-22-34 to IV-27-34, VI-20-32), Shonoryo (VI-11-32), Urai (VI-26-32), Rokki (V-13-34 to V-20-34) Bukai, Suisharyo (VI-10-32), Musha (V-18-32).

146. *GYROPHAENA* sp.

Localities.—Formosa, Musha (V-20-32).

147. *GYROPHAENA* sp.

Localities.—Formosa, Rokki (V-13-34).

148. *GYROPHAENA* sp.

Localities.—Formosa, Bukai (VI-13-34).

149. *COENONICA ANGUSTICOLLIS* Cameron

Localities.—China, Hainan Island, Ta Hian (VI-14-35).

150. *COENONICA FORMOSAE*, new species

Foreparts moderately shining: head black, thorax dark brown; elytra brownish yellow scarcely infuscate postero-externally; abdomen much more shining, black, the raised side and posterior margins of the tergites broadly yellowish red. Antennae black, the first three segments and legs reddish yellow. Near *philippina* Bernhauer but larger, the punctures of head larger and not so close, the thoracic impressions weaker, the elytra much more finely, not asperately punctured, the antennae longer and stouter. Head narrower than the thorax (1.75:2.5), the eye a little shorter than the postocular region, impunctate in front and on vertex, elsewhere with small, rather close umbilicate punctures. Antennae moderately long, rather stout, the second and third segments of equal length, fourth a little longer than broad, fifth to tenth transverse, the penultimate about twice as broad as long. Thorax transverse (2.5:2), the sides rounded in front, retracted and slightly sinuate before the obtuse and somewhat prominent posterior angles, in the posterior half before the middle of the base with a pair of parallel longitudinal sulci, the puncturation rather close and like the head. Elytra longer (2.2:2) and broader than the thorax, broader than long (3:2.2), the punctures simple, much finer and much less close. Abdomen a little narrowed before the apex, very finely and very sparingly punctured. Except for a fine coriaceous ground sculpture at the base of the head, the whole insect without ground sculpture. In the two examples no secondary sexual characters are present. Length, 3-3.2 mm.

Type locality.—Formosa, Arisan.

Types.—Holotype, U.S.N.M. No. 58742; one paratype in my collection.

151. *COENONICA LEWISIA* Sharp

Localities.—Japan, Tokyo (Oct. 1931).

152. HOMALOTA FRATERNA Sharp

Localities.—Japan, Tokyo (II-20-31, VII-9-31, III-9-31, IV-9-31), Yokohama (IV-6-31); China, Hainan Island, Chung Kon (VII-13-35).

153. ANOMOGNATHUS ARMATUS Sharp

Localities.—Japan, Kyushu, Moji (III-24-32), Tokyo (II-20-31).

154. BRACHIDA sp.

Localities.—Formosa, Rokki (V-13-34).

155. FALAGRIA CONCINNA Erichson

Localities.—Japan, Tokyo (XI-5-30).

156. FALAGRIA sp.

Localities.—Japan, Mount Takao (IV-18-30).

157. ATHETA (ALOCONOTA) sp.

Localities.—Formosa, Arisan (V-25-34).

158. ATHETA (METAXYA) LUCIDULA Cameron

Localities.—Japan, Tokyo (IV-14-31).

159. ATHETA (METAXYA) PSEUDOELONGATULA Bernhauer

Localities.—Japan, Tokyo (III-20-31, I-15-31).

160. ATHETA (DOCHMONOTA) SAUTERI Bernhauer

Localities.—Japan, Yamanashi (IV-4-31), Tokyo (IV-14-31); Formosa, Arisan (V-25-34).

161. ATHETA (LIOGLUTA) FORMOSAE, new species

Shining; head, thorax, and abdomen black, the posterior margins of the tergites narrowly rufescent; elytra brownish red. Antennae reddish brown, the first segment blackish. Legs reddish yellow. In build, color, and lustre scarcely differing from *hypnorum* Kiesenwetter but with differently colored antennae and the penultimate segments fully as long as broad and also in the following respects: Head more finely much more sparingly punctured and with scarcely visible ground sculpture; thorax more finely and obsoletely but about as closely punctured, ground sculpture absent; elytra as closely but rather more finely punctured and without ground sculpture; abdomen more finely and much more sparingly punctured, the ground sculpture very fine, transverse. Foreparts with fine rather close yellow pubescence, that of the abdomen longer and more sparing. Three examples without apparent sexual characters. Length, 3.5 mm.

Type locality.—Formosa, Arisan.

Types.—Holotype and one paratype, U.S.N.M. No. 58743; one paratype in my collection.

Records.—Formosa, Arisan (VI-5-32), Musha (VI-31-32).

162. *ATHETA* (*CHAETIDA*) *LONGICORNIS* Gravenhorst

Localities.—Formosa, Taiheizan (V-9-32).

163. *ATHETA* (*CHAETIDA*) sp.

Localities.—Formosa, Musha (V-20-32).

164. *ATHETA* (*COPROTHASSA*) *SORDIDA* Marsham

Localities.—Japan, Tokyo (IV-19-31).

165. *ATHETA* sp.

Localities.—Formosa, Arisan (VI-6-32).

166. *PELIOPTERA FORMOSAE*, new species

Head, thorax, and abdomen black, the head and thorax greasy lustrous, the abdomen shining, the posterior margins of the tergites narrowly rufescent; elytra yellow, greasy lustrous. Antennae black, the first segment reddish yellow. Legs reddish yellow. Male, in size, build, and color much like *acuticollis* Kraatz but the foreparts less shining and with different sculpture. Head orbicular, the eye almost as long as the postocular region, narrower than the thorax, the vertex superficially impressed, along the middle impunctate, elsewhere with small moderately close punctures and distinct coriaceous ground sculpture. Antennae with the first and second segments of about equal length, the third a little shorter and narrower, the fourth to tenth transverse differing but little, about a half broader than long, eleventh as long as the ninth and tenth together. Thorax very slightly transverse, the sides feebly rounded, all the angles broadly rounded, the base before the scutellum produced a little backward as in *acuticollis*, the disc with four larger quadrately placed punctures, the general puncturation finer and closer than on the head but with similar ground sculpture. Elytra very slightly longer but broader than the thorax, broader than long (2.75:2), not emarginate postero-externally, finely and closely punctured, finely coriaceous, with a strong shining keel near the suture extending nearly from the base and parallel to the suture to beyond the middle and there curved slightly inward. Abdomen parallel, almost impunctate, the ground sculpture very fine and transverse, the third, fourth, and seventh tergites at the middle of the posterior margin each with a tubercle, that of the seventh the largest: eighth with seven or eight short ridges at the posterior margin which is truncate and feebly crenulate. Female, unknown. Length, 3 mm.

Type locality.—Formosa, Arisan.

Types.—Holotype and one paratype, U.S.N.M. No. 58748; one paratype in my collection; collected V-25-34.

167. *PELIOPTERA* sp.

Localities.—Formosa, Hassenzan (VI-21-32).

168. *MIMOXYPODA* sp.

Localities.—Formosa, Rokki (V-13-34).

169. *ORPHNEBIUS* sp.

Localities.—Formosa, Arisan (V-25-34).

170. *ORPHNEBIUS* sp.

Localities.—China, eastern Kwantung, Tsin Leong San (VI-3-35).

171. *ZYRAS FORMOSAE* Bernhauer

Localities.—Formosa, Suisha (V-28-32).

172. *ZYRAS SAUTERI* Bernhauer

Localities.—Formosa, Suisha (V-28-32).

173. *ZYRAS* sp.

Localities.—Formosa, Suisha (VI-1-34).

174. *ZYRAS* sp.

Localities.—Formosa, Bukai (VI-13-34).

OMOPLANDRIA, new genus

In facies much like a small *Hoplandria* Kraatz but differing in the narrow pointed mesosternal process, the bidentate right mandible, and much shorter differently formed tongue. Temples margined below. Labrum transverse, feebly bisinuate in front. Mandibles stout, pointed, the right with two teeth at the middle. Maxillary palpi with small first segment, second larger, gradually thickened towards apex, third longer and stouter apically, fourth small, subulate, fifth yet smaller. Labium transverse, trapezoidal with anterior border fully arcuately emarginate. Labial palpi with first segment short and stout, second narrower and much shorter, almost as long as broad, third narrower and much longer, fourth small. Tongue short and broad, the sides rounded, widened toward apex and briefly bilobed, the lobes separated by a small arcuate emargination, their apices rounded. Pronotal epipleura not visible from the side. Mesosternum simple, its process pointed and extending nearly whole length of coxae, these narrowly separated. Tibiae finely setose, tarsi 4.5.5. the first segment of posterior scarcely longer than the second, shorter than the fifth.

175. *OMOPLANDRIA FUSCIPENNIS*, new species

Moderately shining; head and fourth and fifth visible tergites black, the posterior margin of the latter rufescent, thorax and rest of abdomen reddish brown, elytra yellowish brown. Antennae and legs reddish yellow. Somewhat resembling in build the subgenus *Acrotona* Thoms. Head a good deal narrower than the thorax, eyes moderate, longer than the postocular region, finely moderately closely punctured, finely coriaceous, the disc in male slightly flattened. Antennae short, the first two segments of equal length, third a little shorter and narrower, fourth to tenth transverse, gradually increasing in width, the penultimate $2\frac{1}{2}$ times broader than long, eleventh small. Thorax transverse, twice as broad as long, the sides rounded, more retracted in front, the posterior angles rounded, the disc in male slightly flattened, the sculpture as on the head. Elytra nearly twice as long as thorax, broader than long (2.5:2), finely more closely punctured, finely asperate, the ground sculpture very fine. Abdomen narrowed toward apex, very finely, moderately closely punctured on the anterior tergites, more sparingly behind, the ground sculpture feeble. Male, first visible tergite on each side near the lateral margin with a short, slightly curved pointed spine: fifth with a median keel behind: sixth arcuately emarginate and crenulate in the middle of the posterior margin with a small tubercle adjacent, elsewhere with a few smaller scattered granules. Length, 2-2.5 mm.

Type locality.—Formosa, Arisan.

Types.—Holotype and 23 paratypes, U.S.N.M. No. 58744; two paratypes in my collection; two paratypes in the Gressitt collection in the California Academy of Sciences (C. A. S. No. 5956).

176. *ALEOCHARA* (s. str.) *FORMOSAE*, new species

In size, build, and antennal structure similar to *lata* Gravenhorst but differing as follows: The first three segments of the antennae and the eighth tergite are reddish yellow, the puncturation of head and thorax finer and not so close, the abdomen is distinctly more closely punctured throughout, in other respects similar. From *parens* Sharp it differs in the more robust build, much more finely and less closely punctured head and thorax, coarser sculpture of the elytra, more coarsely and rather more closely punctured abdomen.

Type locality.—Formosa, Musha.

Types.—Holotype, U.S.N.M. No. 58745; one paratype in my collection; collected V-18-32.

177. *ALEOCHARA* (s. str.) *PARENS* Sharp

Localities.—Japan, Tokyo (XI-5-30, IV-28-31, VI-7-31).

178. *ALEOCHARA* (*EURYODMA*) *PRAESUL* Sharp

Localities.—Japan, Tokyo.

179. *ALEOCHARA* sp.

Localities.—China, Hainan Island, Vo Lau (VII-2-35).

180. *TETRASTICTA* sp.

Localities.—Formosa, Hassenzan (VI-21-32).

181. *PSEUDOPLANDRIA FORMOSAE*, new species

Shining, pitchy black. Antennae black, the first three segments and apex of the last reddish yellow. In build and coloring scarcely differing from *densiventris* Cameron, but the antennae are longer, the penultimate segments fully as long as broad, the elytra and abdomen less closely punctured. The head and thorax are very finely and very sparingly punctured, the elytra finely, scarcely asperately, rather closely punctured. Male, seventh tergite with an extremely fine median keel on the posterior half. Length, 3.75 mm.

Type locality.—Formosa, Taiheizan.

Types.—Holotype and two paratypes, U.S.N.M. No. 58746; one paratype in my collection; one paratype in the Gressitt collection in the California Academy of Sciences (C. A. S. No. 5957).

Records.—Formosa, Taiheizan (V-9-32), Arisan (V-25-34).

182. *PSEUDOPLANDRIA CURTICORNIS*, new species

Shining, pitchy black, the lateral and posterior margins of the tergites more or less broadly rufescent. Antennae and legs reddish yellow. In size and build very like *frugivora* Cameron, but the antennae are longer and lighter in color, the sixth and seventh segments are less transverse, the punctures of the head are superficial but much larger and closer, the thorax however is as finely but less sparingly punctured, the elytra are more finely and rather less closely punctured, the tergites are closely punctured at their bases but much more sparingly elsewhere, whereas in *frugivora* the tergites are practically impunctate at bases. Male, seventh tergite with a small tubercle about the middle; eighth broadly arcuately emarginate and finely crenulate. Length, 3 mm.

Type locality.—Formosa, Hassenzan.

Types.—Holotype and seven paratypes, U.S.N.M. No. 58747; one paratype in my collection; one paratype in the Gressitt Collection in the California Academy of Sciences (C. A. S. No. 5958).

Records.—Formosa, Hassenzan (IV-22-34), Taiheizan (V-7-32), Arisan (V-25-34).

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ADDITIONS TO THE ECHIUROID FAUNA OF THE NORTH PACIFIC OCEAN

By WALTER KENRICK FISHER

THE material upon which this paper is based consists of a specimen donated by Dr. J. E. Lynch, of the University of Washington, and others dredged off the coast of California by the steamer *Albatross* in 1904. The *Albatross* specimens are a part of a considerable collection of unworked sipunculoid and echiuroid worms, accumulated by the late Prof. H. B. Ward, which did not become available for study until after the publication of my "Echiuroid Worms of the North Pacific Ocean" (1946). About a third of this collection, including some of the echiuroids of California, had deteriorated beyond redemption. What remains is of considerable interest. There is a new and primitive genus of the Bonelliidae, while *Arhynchite*, supposed to lack a proboscis, can now be shown to possess a well-developed one.

I have used this opportunity to revise the keys to the genera of the families Echiuridae and Bonelliidae.

SYNOPSIS OF GENERA OF ECHIURIDAE

- a*¹. Two circles of caudal setae..... *Echiurus* Guérin-Ménéville, 1831
- a*². No posterior setae present.
- b*¹. No differentiated thicker bands in longitudinal muscle layer.
- c*¹. Nephrostome of nephridia without elongated spirally coiled lips.
- d*¹. Neurointestinal blood vessel in direct connection with dorsal vessel by a ring vessel at end of foregut; segment of intestine between ring vessel and beginning of siphon short and with ciliated groove; nephrostome with inconspicuous lips; proboscis not especially expanded at tip, often deciduous..... *Thalassema* Lamarck, 1801

- d*². Neurointestinal vessel connected with dorsal vessel directly by a ring vessel or indirectly by numerous capillaries in wall of gut; segment of intestine between stomach and beginning of siphon very long (2 or 3 times body length), with or without ciliated groove; nephrostome with conspicuous flaplike lip; proboscis very deciduous, long, slender, expanded at tip----- *Arhynchite* Sato, 1937
- c*². Nephrostome with elongated, usually spirally coiled lips. *Anelassorhynchus* Annandale, 1922
- b*². Longitudinal muscle layer with very slight to pronounced differentiation into longitudinal bands, 6 or more in number.
- c*¹. Nephrostome of nephridia without spirally coiled lips; inner layer of muscles not differentiated into separate transverse fascicles between longitudinal bands----- *Lissomyema* Fisher, 1946
- c*². Nephrostome with elongated spirally coiled lips.
- d*¹. Differentiated longitudinal muscle bands weak, zones between not showing a fasciculate arrangement of inner oblique muscles; in small specimens longitudinal bands very faint or visible only in posterior region----- *Listriolobus* W. Fischer, 1926
- d*². Longitudinal muscle bands strongly developed, the zones between crossed by separated fascicles of innermost, oblique layer.
- e*¹. Nephridia in 1 to 5 pairs; vascular ring at beginning of midgut. *Ochetostoma* Leuckart and Rüppell, 1828
- e*². Nephridia, at least in male, in 6 to 14 groups of 1 to 4, the groups arranged in pairs; vascular ring vessel at posterior end of pharynx----- *Ikedosoma* Bock, 1942

Genus ANELASSORHYNCHUS Annandale

Anelassorhynchus ANNANDALE, 1922, p. 148 (type, *Thalassema branchiorhynchus* Annandale and Kemp, 1915).

Diagnosis.—Resembling *Thalassema* s. s. in having the longitudinal muscle layer of the body of uniform thickness without specialized longitudinal bands, but differing in having prolonged, often spirally coiled, lips to nephrostome.

Remarks.—Annandale based the genus on the structure of the proboscis of two species, *Th. branchiorhynchus* and *Th. dendrorhynchus*. In these Indian species the proboscis is short, stout, not very extensile, and the lateral margins bear dendritic gill-like outgrowths. The first species was found in a tidal creek on the outskirts of Calcutta, the latter in Chilka Lake, a lagoon on the east coast of India and connected with the Bay of Bengal. He also included *Th. sabinum* Lankester, a brackish-water species, and *Th. microrhynchus* Prasad from Chandipore, Orissa, which do have dendritic outgrowths. In 1935 Prasad described another species having a frilly margin to the proboscis—*Thalassema marshalli* found in estuarine waters of the Irrawaddy River near Rangoon and congeneric with *Th. branchiorhynchus*.

It seems to me that the modifications of the proboscis, which exhibit a number of gradations in complexity, are adaptations to an ecology

in several ways abnormal, a parallel development being found in *Ochetostoma arkati* (Prashad). But these species agree with others having a normal proboscis in the character of the nephrostome in combination with the absence of longitudinal muscle bands.

The following species belong in this genus:

- a*¹. With 1 pair of nephridia opening behind setae----- abyssalis, new species
*a*². With 2 pairs of nephridia opening behind setae.
 *b*¹. Adherent proboscis with more or less frilly margin.
 branchiorhynchus (Annandale and Kemp)
 dendrorhynchus (Annandale and Kemp)
 marshalli (Prashad)
 *b*². Proboscis adherent but its margin not modified_ microrhynchus (Prashad)
 sabinus (Lanchester)
 *b*³. Proboscis deciduous----- semoni (Fischer)
 porcellus Fisher¹
- a*³. With 3 pairs of nephridia.
 *b*¹. All nephridia opening behind setae----- mucosus (Ikeda)
 vegrandis (Lampert)
 *b*². First pair of nephridia opening in front of setae---- inanensis (Ikeda)
 moebii (Greef)

ANELASSORHYNCHUS ABYSSALIS, new species

PLATE 28

Diagnosis.—Differing from all known species of the genus in having only one pair of nephridia; neurointestinal vessel connected with dorsal vessel by numerous small vessels in wall of stomach; therefore no direct ring vessel present.

Description.—All specimens are in a deplorable condition, the viscera having been lost through anus, probably owing to release of water pressure. All have lost the proboscis and all except type the setae and anterior visceral complex. None has the anal vesicles. Longest specimen, probably unnaturally elongated, 230 mm.; type, 85 mm.; slender, distorted. Body wall slightly translucent, probably markedly so in life. Skin smooth, with numerous scattered papillae almost flush with surface and more translucent than the skin, so that they resemble tiny grains of cooked tapioca. In the head region of type they are convex, opaque, and more normal, but not visible without some magnification. Coelomic surface of body wall smooth, but in contracted specimen the longitudinal layer is crossed by wavy dark lines encircling body.

Setae two, close together and close to mouth. They are 10 mm. long with a relatively large, open, curved hook. The slender inter-basal muscle is not surrounded by the neurointestinal vessel. The very numerous basilateral muscles are long and slender. The muscles from proximal end of sheath to lateral body wall are separated from

¹ Pacific Sci., vol. 2, p. 274, Oct. 1948.

the innermost muscle layer for most of their length and are not in the form of a dissepiment at right angles to body wall.

Nephridia two, small, the lips of nephrostome greatly prolonged but not in a spiral. Nephridiopores are rather close behind the setae, but farther from nerve cord than setae.

The foregut survived only in the type. It is fairly long, with a well-marked gizzard, the anterior end of which coincides with the posterior margin of the double ventral mesentery. In front is the esophagus, thrown into loops and held in place by the ventral mesenteries, while the short pharynx is attached to body wall by numerous radiating muscular frenula. The stomach is more inflated than gizzard, and its translucent walls are marked by longitudinal lines. A very short distance posterior to attachment of neurointestinal vessel a very inconspicuous ciliated groove begins, but the length of presiphonal intestine can not be determined. In one specimen are two fragments of the intestine having a well-developed siphon.

The vascular system is characterized by absence of any relation with the interbasal muscle of setae, and the absence of a direct well-marked ring vessel. Near the intestine the neurointestinal vessel divides in two, and where it meets the wall at posterior end of stomach there is a slight inflation. But beyond this point there is no simple vessel passing over the wall to join the dorsal blood vessel, the inflated part of which ends at middle of stomach, to be continued a short distance by a very constricted vessel. There seems to be no alternative but a nexus through numerous small vessels in the wall of stomach, a very unusual condition outside the Bonelliidae (except in *Arhynchite*).

Type.—U.S.N.M. No. 21082.

Type locality.—Albatross station 4547, 10.5 miles northwest of Point Pinos, Monterey Bay, Calif., 1,083 fathoms, gray mud, rocks, June 6, 1904, 4 specimens. Near this locality, at station 4537, 1,041 fathoms, the bottom temperature was 38.5° F.

Genus LISTRIOLOBUS W. Fischer

Listriolobus W. FISCHER, 1926, p. 110 (type, *Listriolobus bahamensis* Fischer).—FISHER, 1946, p. 233.

Diagnosis.—Differing from *Thalassema* s. s. in having elongate, spirally coiled lips to nephrostome and 6 to 16 (type) narrow meridional thickenings of the middle longitudinal muscle layer. Differing from *Aneclassarhynchus* in having these same muscle bands, and from *Ochetostoma* in having the inner oblique layer a smooth continuous sheet not divided between the muscle bands into separate fascicles. Nephridia one to three pairs; interbasal muscle of setae present or absent.

Remarks.—The type of this genus is the species from Green Turtle Bay, off Great Abaco Island, Bahamas, which Charles B. Wilson (1900, p. 176) erroneously identified as *Ochetostoma erythrogrammon* Leuckart and Rüppell and which Wilhelm Fischer (1926, p. 110) named *Listriolobus bahamensis*. The generic name derives from Spengel (1912, p. 316), who pointed out the peculiarity of the muscle bands but neglected to designate a species with a valid name, mentioning only *Thalassema erythrogrammon* of Sluiter (1883) and of Wilson (1900), neither being true *erythrogrammon* (the type of *Ochetostoma*).

I designated *L. bahamensis* as the type (1946, p. 233). Wilson's specimen was 160 mm. long, including proboscis 30 mm., and 24 mm. in greatest diameter. Longitudinal muscle bands 16, about 1.5 mm. wide, with interspaces 4.5 to 7 mm. wide at middle of body. There were three pairs of nephridia enormously swollen and packed with sperm. The anterior pair opened 3 mm. in front of the setae and all three pairs were furnished with spirally coiled nephrostome lips. Anal glands, 90 mm. long and without visible funnels. Interbasal muscle of setae not mentioned.

I have examined a small, contracted specimen from Cayo Cristo, Cuba (American Museum of Natural History), which is probably *L. bahamensis*. It is only 20 mm. long, lacks a proboscis, and the muscle bands are not all clearly defined, but it agrees with Wilson's description in essentials. There are three pairs of nephridia, the anteriormost just in front of the setae, which are enveloped by a cone of muscle without obvious separated fascicles of muscle. There is no interbasal muscle. The foregut is close to the nerve cord so that the ventral mesentery is poorly developed. The pharynx is thin walled and esophagus long, but the gizzard and stomach can not be identified on account of poor preservation. The neurointestinal vessel is double but unites before joining ventral vessel. At the dorsal end each branch seems to join directly the dorsal vessel, a definite ring vessel not being apparent. The anal vesicles are very long and there is a coecum in front of the large cloaca.

In his revision, Bock (1942) gave *Listriolobus* at best only subgeneric rank under *Ochetostoma*, but *L. pelodes* Fisher (1946) with two pairs of nephridia and eight muscle bands was not then known. Now the discovery of a new, well-marked species with only one pair of nephridia and six muscle bands greatly strengthens the position of *Listriolobus* as a group of generic stature.

LISTRIOLOBUS HEXAMYOTUS, new species

PLATE 29

Diagnosis.—Differing from all known species in having only six longitudinal muscle bands and one pair of nephridia; neurointestinal blood vessel does not form a loop surrounding interbasal muscle, but it is undivided from ventral blood vessel to gut where there is an inconspicuous ring vessel; foregut very short; body wall translucent; proboscis unknown.

Description.—Length 40–63 mm.; thickness 7–10 mm.; proboscis lost; form subcylindrical, sometimes slightly produced at anterior end. The thoroughly relaxed type has a thin translucent body wall and the six longitudinal muscle bands are very inconspicuous. The other 3 specimens are contracted and have an opaque body wall marked by six shallow longitudinal furrows representing the muscle bands. Only under strong magnification are the papillae visible—largest at anterior end. These are low, conical, with a central dark spot, and are in spaced transverse series. They can be best seen only in the relaxed type. When the skin is contracted they may be more or less submerged in the folds, though here and there on limited areas they are definite enough. Color gray or brownish gray. Coelomic surface smooth, the inner oblique layer not interrupted, as in *Ochetostoma*, by the longitudinal bands.

Setae two, relatively long, close together, with a slender interbasal muscle which does not pass through a loop of the neurointestinal blood vessel. There are a large number of very slender and long basilateral muscles, only a few of which are indicated in the figure. The seta sheaths are connected at body wall by a strong transverse muscle; and extending laterally, at right angles to body wall like a low dissepiment, is a muscular apparatus the purpose of which apparently is to separate the distal ends of setae (pl. 29, fig. 2, *SM*).

Nephridia only two, very small, with a conspicuous nephrostome having an obvious neck and the lips produced as in other members of the genus. There are no genital products in the nephridia.

Anal vesicles relatively very small, only 8 or 9 mm. long in the type (length 63 mm.), thin walled and without special features. The cloaca is also very small (about 2 mm. long), but very muscular. The end of the nerve cord passes on to its ventral surface and divides into two trunks, which appear to end at the narrow constriction between intestine and cloaca.

The alimentary canal is of moderate length, very delicate, and the thin-walled intestine is crowded with mud pellets. The foregut is short, much shorter than in *L. pelodes* Fisher, and its parts are not readily recognizable. Both gizzard and stomach are reduced almost to a minimum (pl. 29, fig. 2). The presiphonal intestine is also of

moderate length. The whole complex in a relaxed specimen appears to be moved far forward and to be dominated by the setae and their numerous muscles. I was unable to find the coecum in the type, but in another specimen there is a very small spongy body in the proper location. In *L. pelodes* it is of normal size.

The vascular system differs from that of *L. pelodes* in respect to the neurointestinal vessel which has no loop surrounding the interbasal muscle of setae and does not divide into two until it reaches the gut, where the ring vessel is inconspicuous.

Type.—U.S.N.M. No. 21079.

Type locality.—Albatross station 4339, off San Diego, Calif., 287–369 fathoms, green mud, March 10, 1904; 4 specimens.

Genus ARHYNCHITE Sato

Arhynchite SATO, 1937, p. 142 (type, *Thalassema arhynchite* Ikeda).

Diagnosis.—Proboscis deciduous, long, slender, ribbonlike, with a small, expanded, fan-shaped extremity, and a closed base forming lower lip; nephridia two, the nephrostome with one lip prominently produced, leaflike and with an irregular or laciniate margin; alimentary canal very long, the presiphonal segment two to three times body length, with or without a ciliated groove; blood system with or lacking a ring vessel; no coecum; anal vesicles *Thalassema*-like; muscles of body wall smooth with no concentration of fibres into bands; setae two, with interbasal muscle.

Remarks.—The discovery of a well-developed proboscis in two species is interesting to say the least. Ikeda examined carefully a number of specimens from Sapporo and was convinced that a proboscis was not present, while Sato sectioned the mouth region. "No trace of a detached proboscis was found, and thus the mouth opening was entirely enclosed by means of the papillae which were regularly arranged around the mouth" (1937, p. 145). What Sato did not do was to trace the ventral nerve to ascertain if it formed a ring around the mouth, the only real test. I dissected one of the specimens of *californicus* and found the nerve cord to be ruptured at the point where it divides into two. But superficially there is no hint that a proboscis has been detached, and this was true also of *A. inamoenus*, which I described in 1946 (p. 247).

I think the discovery of a proboscis in the two species herein described need not invalidate the genus. The nephrostome and the very long presiphonal segment of the intestine separate the group from *Thalassema*. Also the form of the proboscis is different from that of *Thalassema*. The absence of a ring vessel in *inamoenus* and *californicus* would be a useful distinction but unfortunately *puget-*

tensis has an especially large one, while in *arhynchite* of Japan the connection between dorsal and neurointestinal vessels seems to be direct. The absence of a coecum indicates a certain remoteness from *Thalassema*.

The males do not differ from females except in the gonads.

ARRHYNCHITE CALIFORNICUS, new species

PLATE 30

Diagnosis.—Differing from *A. arhynchite* of Japan (in which proboscis is unknown) in having an indirect connection between dorsal and neurointestinal blood vessels, larger anal vesicles with one or two large frenula; and possibly also in the form of the nephrostome.

Description.—Body form like a blunt cigar; length 70 to 90 mm.; diameter about 15 to 20 mm. Body wall rather thick, opaque, the skin with small, spaced, unequal, convex glands, which form more or less distinct transverse rows or interrupted rings. Between the glands are very fine transverse wrinkles. At both ends of body the glands are very much larger, often low papilliform, especially ventrally, and much more conspicuous than on middle region of body where they are sometimes nearly obliterated.

The proboscis, of which there are five detached examples having lengths of 65, 72, 82, and 85 mm., is ribbonlike, thin, and 5 mm. broad at the maximum. The somewhat fan-shaped expanded tip has a thickened border, which reappears on the proximal half of the stem, here being scalloped or fluted. The margin closes in and joins close to the base, forming the lower lip. Probably in life the margins meet, forming a tube. The nerve can be easily traced near the margin and follows closely the border of the distal fan, within the thickened portion. Also down the center the median blood vessel can be seen in the central mass of longitudinal muscle fibres. At its base the proboscis is constricted and when in place on the animal is surrounded by the ring of papillae (beneath which are strong sphincters) which have been mistaken for lips. The functional mouth is detached with the proboscis and is very small.

Setae two, close to anterior end, 6.5 mm. long, with a hook very similar to that of *inamoenus* (in which setae are 11 mm.). Interbasal muscle well developed, passing through a small loop of neurointestinal vessel.

Nephridia two, inserted not quite so close to nerve cord as in *inamoenus* and behind setae a distance about equal to length of latter. In the type there is an extra nephridium on right side, inserted in front of seta and close to it. Nephridia vary greatly in extent of

inflation. Characteristic is a flaplike nephrostome of variable but conspicuous size (upward of 4 mm. long) having a lobed or lacinate border and a crescentic slit near base on anterior or ventral side. It is much larger than in *inamoenus*, which lacks the lobes. Both specimens are males.

Anal vesicles two, thin-walled, voluminous at base and terminally slender. They are 40 to 60 mm. long and hence over half the length of body. A characteristic feature is the presence of one or two broad frenula at about two-thirds the length from base. These, and slender frenula near the base, anchor the vesicles to body wall. Ciliated cups are widely scattered on surface of vesicle. The cloaca is very small, the length sufficient only to accommodate the base of the vesicles which are attached close together on the ventral side. Mucosa of cloaca is longitudinally plicated. A slight thickening of tissue at end of ciliated groove, where the intestine joins the cloaca, may represent a vestigial coecum, but it is very small, and not comparable to the normal coecum of *Thalassema*.

Alimentary canal excessively long, with numerous coils attached to body by a multitude of rather strong frenula. In a specimen 80 mm. long, having the gut not overstuffed with pellets, the foregut is 30 mm., presiphonal intestine 200 mm., siphonal segment 160 mm., and postsiphonal, provided with ciliated groove, 235 mm.; total, 652 mm. The foregut is not clearly subdivided. Back of the pharynx-esophagus there is a region about 9 mm. long having the ring markings of the gizzard, leaving an unusually short segment for the stomach (*C*). The very long presiphonal intestine has no ciliated groove. The anterior portion of it lies near the nerve cord and proceeds to posterior end of body, where there is a sharp bend forward.

The blood system is characterized by an indirect or capillary connection between the dorsal and neurointestinal vessels, no ring vessel being present. The neurointestinal vessel forms a small loop around the interbasal muscle of setae; in *inamoenus* the loop is not present.

Type.—U.S.N.M. No. 21085.

Type locality.—Albatross station 4525, Monterey Bay, Calif., 9.4 miles northeast of Point Pinos, 222 fathoms, soft gray mud, May 26, 1904, 2 specimens. A third mutilated specimen and five proboscises were in container.

ARHYNCHITE PUGETTENSIS, new species

PLATES 31, 32

Diagnosis.—Differing from *A. californicus* in having a conspicuous ring blood vessel at end of foregut and a well-developed ciliated groove

throughout the length of the presiphonal segment of intestine; length 100 mm.; thickness 15-18 mm.

Description.—The body is cylindrical, abruptly tapered and blunt at both ends. The skin is covered all over with closely placed elevated irregular glands of several sizes, spaced less than the diameter of the largest. They are larger at the ends of body but are perfectly visible to the naked eye all over the surface and there is no smooth area anywhere. Between the glands the skin is finely wrinkled transversely. The glands were more prominent when the specimen was in formalin than when subsequently preserved in alcohol. Only the basal 18 mm. of the proboscis remains. The margin joins at the base as in *californicus* to form the lower lip, and the concave surface is reddish brown.

Setae two, strong, terminally evenly curved, and only about 5 mm. behind mouth. There is an interbasal muscle that passes through the neurointestinal blood vessel.

Nephridia two, longer than the preserved specimen and filled with eggs (May 22). The nephrostome has the characteristic expanded lip with a lobed or shallowly laciniate border and is about 4 mm. long, but in life is probably longer.

The anal vesicles are unequal in size; probably the inequality is abnormal. The ciliated funnels are very small and well spaced.

ALIMENTARY CANAL: The plan of the alimentary canal is shown in plate 31, figure 1. The middle portion (siphonal gut) is anchored to the dorsal and dorsolateral regions of body wall, while the presiphonal gut (black) and hindgut (stippled) is fastened to the ventral and ventrolateral walls. The presiphonal gut consists of a long loop, the proximal half of which is anchored by very numerous frenula close to right side of nerve cord. But the segment between + and + is anchored by very numerous frenula to a cablelike muscle attached forward (pl. 31, fig. 2). There is a conspicuous ciliated groove extending the entire length of the presiphonal gut, the outer wall of the proximal half of which is marked by transverse folds. The siphon is well developed but is not indicated in figure. This siphonal region of intestine (unshaded in figure) lies dorsally to the rest, while the postsiphonal portion, characterized by ciliated groove, is mostly on the left side. Its distal part is attached to the left of nerve cord. The ciliated groove ends ventrally, in the usual place near end of ventral blood vessel, but there is no coecum. The cloaca is relatively small, and the outlet of each anal vesicle is close to anus. The contents of intestine are not molded into pellets.

The foregut has a constriction between the pharynx-esophagus and the gizzard-stomach. The latter is marked by longitudinal and circular lines reflecting the grooves of the lining, but there is no sharp

distinction between the gizzard and the stomach (crop), which ends at the ring blood vessel.

VASCULAR SYSTEM: The vascular system differs sharply from that of *inamoenus* and *californicus* in having a clear-cut large ring vessel. The dorsal blood vessel is voluminous; its anterior part is held in place by broad dorsal frenula which anchor the pharynx. Then follows a free portion over the posterior part of pharynx-esophagus. Posterior to this it is attached to the gizzard by a broad continuous mesentery, from the front edge of which anchoring strands proceed forward to surface of pharynx. Then posteriorly the dorsal vessel is attached to wall of stomach, spiraling to right from the dorsal to ventral side, so that the neurointestinal vessel enters the ring vessel dorsolaterally. The interbasal muscle of setae passes through a loop of the neurointestinal.

Color in formalin, lavender-gray.

Type.—U.S.N.M. No. 21098.

Type-locality.—Puget Sound, Wash. (Normandy Beach, 12 miles south of Seattle), lower limits of a minus 2-foot tide, clam grounds, May 22, 1948, 1 specimen, Sigurd J. Westrheim, collector.

Remarks.—Dr. J. E. Lynch, of the School of Fisheries, University of Washington, who contributed the type specimen, states that to the best of his knowledge this is the first adult echiuroid to be collected in Puget Sound.

The species is very distinct from *californicus* and *inamoenus* in having a direct connection between the dorsal and neurointestinal blood vessels. A careful examination of the presiphonal gut of *californicus* did not reveal any ciliated groove. The material of this species is in too poor condition to ascertain details of the intestinal fastening muscles or frenula and hence whether the arrangement for the presiphonal gut of *pugettensis* is peculiar to the species. The details of the mesentery of the dorsal blood vessel and the shorter lobes of the nephrostomes appear to be of specific value. The great size of the nephridia is probably due to their being packed with eggs, while the disparity in size of the anal vesicles may be an abnormality.

A. arhynchite (Ikeda) of Japan seems to have smaller skin glands and to lack the large ring vessel, but details of the alimentary canal are not available.

Family BONELLIIDAE Baird

In the construction of the following synopsis the first division has been made according to the position of the nephrostome, whether at base of nephridium, at its extreme tip, or placed laterally near the distal end. As the outstanding structural peculiarity common to the whole family, I think modifications of the nephridia contain the key

to major subdivisions. The form of the proboscis is perhaps equally valid, but this organ is obviously more susceptible to environmental influences and it is unfortunately sometimes missing. As a working hypothesis I have assumed that basal nephrostomes are the most primitive; that two nephridia are more ancestral than one, for the same reason that an undivided proboscis is more ancestral; and that the occurrence of two setae, with typical echiuroidean muscle apparatus, precedes in evolution a condition where there are numerous setae having a modified muscle apparatus, or none, or where the setae have disappeared altogether.

In my 1946 key I omitted *Sluiterina* Monro, 1927, and used *Parabonellia* Onoda, 1935, instead of *Ikedella* Monro. I had not then seen the figures published by Wesenberg-Lund (1934, p. 8) and Stephen (1941, pl. 8, fig. 1) clearly demonstrating that *Hamingia arctica* has a terminally bilobed proboscis, not at all thalassemoid, as Monroe, I, and others had supposed.

SYNOPSIS OF GENERA OF BONELLIIDAE

*a*¹. Nephrostome situated at base of nephridium.

*b*¹. Proboscis not branched or cleft at tip; absent in *Nellobia*.

*c*¹. Two nephridia.

*d*¹. Female with 2 well-developed setae; anal vesicles wide sacs provided with a very large number of slender excretory tubules having apical funnel; dorsal vessel of vascular system in direct connection with neurointestinal; male unknown.

*e*¹. Proboscis without specialized funnel at its base; nephridia opening to exterior by separate pores; external ends of setae can retract into a common bursa..... *Maxmülleria* Bock, 1942

*e*². Proboscis with a specialized cup or funnel at its base; nephridia opening to exterior by a single median pore; no bursa into which ends of setae retract..... *Prometor* Fisher, 1948

*d*². No setae; anal vesicles more or less rudimentary, the branched tubules opening directly into thin-walled cloaca; dorsal blood vessel not directly connected with neurointestinal; body wall extremely thin; a specialized genital slit (see *Acanthohamingia*) extending forward from nephridiopores and forming a rudimentary androecium for parasitic males, which are provided with anterior curved setae; proboscis unknown..... *Amalosoma*² Fisher, 1948

*c*². One nephridium.

*d*¹. Setae 2, well developed; anal vesicles 2, elongate, dendritic; male unknown..... *Protonellia* Ikeda, 1908

*d*². Setae 8-10 tiny integumentary spinelets, without muscle apparatus, situated in genital slit extending forward from nephridiopore; body wall thin; males without setae.... *Acanthohamingia* Ikeda, 1910

*d*³. Setae absent.

*e*¹. Skin thick, glandular; in place of proboscis a short truncate snout; voluminous branched anal vesicles present, the branchlets carrying

² Placed in this section because *Amalosoma* is close to *Acanthohamingia*, which has a *Thalassema*-like proboscis.

- a multitude of vase-shaped excretory elements; siphon present; hind intestine abruptly enlarged----- *Nellobia* Fisher, 1946
- c³. Skin thin, translucent; *Thalassema*-like proboscis present; anal vesicles and siphon said to be lacking³----*Sluiterina* Monro, 1927
- b². Proboscis cleft at tip into 2 short or long lobes.
- c¹. Two nephridia; no setae----- *Hamingia* Danielssen and Koren, 1880
- c². One nephridium.
- d¹. Setae 2, typical; dorsal and neurointestinal vessels very indirectly connected by capillaries----- *Bonellia* Rolando, 1822
- d². Setae numerous (29) seated in 2 muscular pads from which muscles radiate; dorsal and neurointestinal blood vessels in direct connection⁴; male large (28.5 mm. long) without setae.
- Acanthobonellia* Fisher, 1948
- b³. Proboscis a short truncate snout; see above----- *Nellobia* Fisher, 1946
- a². Nephrostome at extreme distal end of nephridium; proboscis cleft at tip.
- b¹. Two nephridia serving as egg receptacles, between which is a small unpaired nephridium with a basal nephrostome.
- Austrobonellia* Fisher, 1948
- b². One nephridium, the distal end expanded into a large trumpet-shaped nephrostome.
- c¹. Two setae; neurointestinal vessel starting from intestine at a considerable distance beyond beginning of siphon; elements of anal vesicles short and stout----- *Bonelliopsis* Fisher, 1946
- c². No setae; neurointestinal vessel spanning proximal end of siphon; elements of anal vesicles long and slender---- *Eubonellia* Fisher, 1946
- a³. Nephrostome on a short stalk facing laterally near blind distal end of nephridium.
- b¹. The two nephridia with a small nephrostome laterally near distal end; a small blind tube, projecting into coelom and opening on ventral body wall between the 2 nephridiopores, containing a degenerate male, grown fast to walls of tubule by its posterior end (it lacks setae and has 2 sperm receptacles); gonad of female situated on frenula radiating from cloaca; anal vesicles in form of tubules opening independently into cloaca; 2 setae (plus 2 substitutes).
- Pseudobonellia* Johnston and Tiegs, 1919
- b². One nephridium; no setae; no androecium----- *Ikedella* Monro, 1927
- a⁴. Position of nephrostome unknown; a large median nephridium between 2 small ones; proboscis with 2 short terminal lappets; alimentary canal short, scarcely over twice length of body; size very small (12 mm.); 2 setae (plus 2 substitutes)----- *Archibonellia* W. Fischer, 1919

³ Monro (1927, p. 618) bases the genus on the absence in the type, *Hamingia sibogae*, of siphon and anal vesicles. Sluiter (1902, p. 44, pl. 4, fig. 7) states that the siphon and anal vesicles "seem" to be absent, "was aber nicht ganz sicher ist, da der darm sehr gelitten hat und die Verhältnisse nicht sicher gestellt werden konnten." His figure shows only a small part of the anterior portion of alimentary canal and nothing of the posterior part of the internal anatomy. The text figure of entire animal indicates a proboscis much like that of *Marmülleria*, but the tip looks as if it had been injured and was starting to regenerate. *Sluiterina sibogae* was dredged in 4,391 meters, on nearly black mud, in the Banda Sea.

⁴ Although Ikeda (1907, p. 4) gives no figures of topographical anatomy, he says, "The posterior end of the esophagus is embraced by the heart, a broad vascular sinus of a triangular shape with the apex directed forward. From the basal angles of the heart, there arise two moderately long vessels (commissures) which eventually join the ventral vessel running over the nerve cord." This is the arrangement in *Thalassema* and *Echiurus*, and very different from that of *Bonellia*.

Genus **PROMETOR** Fisher

Prometor FISHER, 1948, p. 857 (type, *P. benthophila* Fisher).

Diagnosis.—Related to *Maxmülleria* Bock; proboscis long and ribbonlike, truncate, the borders fused at base to form a differentiated funnel or cup leading to mouth; one pair of anterior nephridia, into the specialized basal portion of which opens the large nephrostome, which is compressed, fan-shaped, and bilabiate; a single common external nephridiopore; two well-developed setae close together, without a common external bursa into which both can retract; anal vesicles unbranched sacs with a great number of glandular excretory tubules having an apical ciliated funnel; neurointestinal blood vessel directly connected with dorsal; longitudinal muscle layer continuous; only females known; probably sexual dimorphism with dwarf males.

Remarks.—This genus differs from *Maxmülleria* Bock (1942, p. 22) in the presence of a specialized funnel or cup at the base of proboscis, in having only a single nephridiopore, and in lacking a specialized external bursa into which the two closely placed setae can be retracted.

The blood system of *Maxmülleria* and *Prometor* is more like that of *Thalassema* than of the Bonelliidae (*Acanthobonellia* and *Hamin-gia* excepted). The neurointestinal connects directly with the dorsal vessel, a small ring vessel being present. This, however, is on the intestine at the beginning of siphon, and not at end of foregut, as in *Echiurus* and *Thalassema*.

PROMETOR BENTHOPHILA Fisher

PLATES 33, 34

Prometor benthophila FISHER, 1948, p. 857, figs. 1-5.

Description.—Body somewhat slender pear-shaped; anterior third of body wall opaque, tough, the skin with fine transverse wrinkles between very numerous low, flat, closely placed glandular elevations. These are of many sizes, the largest about 1 mm. in diameter, of irregular contour and the surface is smooth in contrast to the wrinkled skin between. Posterior two-thirds of body thinner, translucent, smooth, and without glands, even around anus. The innermost muscular layer is smooth. Length of paratype without proboscis, about 110 mm.

The proboscis is a fleshy ribbon about 55 mm. long (type), the base forming a cup into which the mouth opens, this cup comprising about 7 mm. of the total length. Its lining is folded as if considerable contraction had taken place. In the paratype (pl. 33, fig. 1) the proboscis appears to have been undergoing regeneration. The cup or funnel comprises nearly all the proboscis. The lumen of its constricted basal portion is small and the lining is furrowed longitudinally like a gullet.

In life it is likely that a normal proboscis can be extended at least a meter in length.

About 5 mm. posterior to constricted base of proboscis is the common aperture of the two nephridia, and just in front of these and close together are the broken tips of two slender setae (10 mm. long). Upper ends of setae close together and interbasal muscle short. The basilateral muscles are less numerous and stouter than in *Maxmülleria lankesteri* (Bock, 1942, pl. 4, fig. 1).

Nephridia two, large. The proximal part, into which the large fan-shaped nephrostome opens, is sharply differentiated from the much larger distal portion in which the eggs are stored and is marked by a few shallow furrows. In the type, the wall of the distal portion is opaque but in the paratype it is translucent, so that the few large contained eggs can be seen. The nephridia open by a single median nephridiopore close behind the setae.

The two anal vesicles are elongate sacs. One side of each is fixed to the wall of the mud-filled cloaca. The free surface of each vesicle is closely covered with fusiform, brown excretory tubules, about 0.5 mm. long, from which the terminal funnel has been lost by maceration.

ALIMENTARY CANAL: The intestine consists of fragments ruptured from foregut. In the paratype the foregut is sufficiently intact to show its subdivisions. The buccal cavity or anterior part of pharynx is connected with body wall by numerous radiating muscular frenula. The rest of the pharynx is anchored only by the dorsal and ventral mesenteries not shown in figure. The esophagus (proventriculus of Bock) is externally marked by slight constrictions and the very short gizzard by more widely spaced ones. The stomach (*C*) ends apparently at a permanent sharp elbow where there is a sphincter. The presiphonal segment of intestine is short and devoid of a ciliated groove. The mucosa of pharynx, esophagus, and gizzard is thick, marked by longitudinal and circular furrows, but that of gizzard is not so thick as the mucosa of the distal part of esophagus, which is thrown into prominent lappets much as indicated by Bock (1942, pl. 9, fig. 10). The lining of stomach is thinner than that of gizzard and only the longitudinal furrows are present. The cloaca is thin-walled, crowded with mud, and closely attached dorsally by delicate frenula. There are no ventral frenula. In the paratype a short piece of intestine remains attached to the cloaca. There is no indication of a coecum.

The vascular system is of the echiurid and not bonelliid type. The neurointestinal vessel, however, arises directly by three roots from the dorsal. The ring vessel appears to be of secondary importance. A bonelliid feature is the position of this plexus at the beginning of the siphon and not at the end of the stomach.

The ovary lies along the top of the ventral blood vessel. Its anterior end is well forward but the posterior limit can not be determined.

Male.—Unknown. Search was made in the funnel at base of pharynx and in the pharynx.

Type.—U.S.N.M. No. 21076.

Type locally.—*Albatross* station 4387, off San Diego, Calif., lat. $32^{\circ}32' N.$, long. $118^{\circ}04'20'' W.$, 1,059 fathoms, green mud; 2 incomplete specimens.

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EXPLANATION OF PLATES

[All figures were made by the writer directly from dissections or specimens.]

PLATE 28

Anelassorhynchus abyssalis, new species

1. Anterior complex of type, $\times 10$. The foregut has been drawn to right to reveal the setae and nephridia. (B^1, B^2, B^4 , dorsal, neurointestinal, and ventral blood vessels, respectively; C , stomach; CF , ciliated funnel of nephrostome; G , gizzard; I , small segment of intestine; MI , interbasal muscle; N , nephridium; NC , nerve cord; O , esophagus; P , pharynx; S , seta; SM , seta muscle described in text; VM , double ventral mesentery.)
2. Seta of type, $\times 10$.

PLATE 29

Listriolobus hexamyotus, new species

1. Seta from paratype, $\times 10$.
2. Anterior complex of type, $\times 10$. The foregut is drawn to right to show the nephridia and foreshortened setae. On left, a seta, S' , is drawn full length. From where seta sheath meets body wall, a muscle, SM , extends laterally, one edge attached to body wall and the other free, the outer end near dorso-lateral longitudinal muscle band, ML' . (B^1-B^3 , dorsal, ring, and neurointestinal blood vessels, respectively; C , stomach; CF , ciliated funnel of nephrostome; G , gizzard; I , presiphonal intestine, its ciliated groove dotted; MI , interbasal muscle; ML , position of right ventrolateral muscle of body wall; ML' , left dorsolateral muscle; N , nephridium; NC , nerve cord; P , pharynx; S , seta; S' , a seta pressed flat to show length; Si^1 , proximal end of siphon; SM , dotted, lateral seta muscle described in text; VM , ventral mesentery of pharynx-esophagus.)
3. Side view of paratype, $\times 2$.
4. Skin papillae from near setae, much enlarged.

PLATE 30

Arhynchite californicus, new species

1. Dissection of anterior complex of type, $\times 7$. The anterior part of foregut is in situ, the distal part drawn to right to show nephridia. The + beneath

interbasal muscle indicates position of the extra nephridium. The neuro-intestinal vessel, B^3 , emerges from between the two ventral mesenteries to encircle the interbasal muscle. (Lettering as for plates 28 and 29.)

2. A proboscis, ventral side, $\times 2$.
3. Tip of proboscis, $\times 5$.
4. Portion of proboscis near base, $\times 5$.
5. Ventral side of anterior end of type, $\times 4$.

PLATE 31

Arhynchite pugettensis, new species

1. Map of alimentary canal, $\times 2$, in approximate natural position when animal is opened along middorsal line. The foregut is unshaded; presiphonal gut in solid black; siphonal gut unshaded; postsiphonal gut stippled. Muscular mesenteries and details of anterior complex omitted. Only left nephridium shown in entirety. (AV , anal vesicles; CF , nephrostome; Cl , cloaca; I , presiphonal intestine; N , nephridium; Si^1 and Si^2 , beginning and end of siphon.)
2. The segment of presiphonal gut between $++$ of fig. 1 to show arrangement of muscular mesenteries attached near nerve cord. (NC , nerve cord.)

PLATE 32

Arhynchite pugettensis, new species

1. Anterior complex, $\times 5$. The foregut has been drawn far to right and only the beginning of presiphonal gut is shown. (M , muscular mesenteries of foregut; M' , mesentery of presiphonal gut; CG , ciliated groove of presiphonal gut; other letters as for plates 28 and 29.)
2. Proximal end of detached, incomplete proboscis, $\times 2$: a , Dorsal, and b , ventral aspects; c , the basal aperture enlarged.

PLATE 33

Prometor benthophila Fisher

1. Ventral view of paratype, natural size. The thin-walled posterior portion of body was badly torn so that reconstruction was necessary. The inflation is probably artificial. Proboscis was evidently undergoing regeneration.
- 1a. Ventrolateral aspect of anterior end of paratype, $\times 2$.
2. Ventral view of anterior end of type, natural size, to show the basal funnel of proboscis (leading to mouth), the two setae, and single nephridiopore.
- 2a. Lateral view of proboscis funnel, enlarged.
- 2b. Setae (S), nephridiopore (NP), and surrounding skin of type, $\times 10$. The tip of each seta is missing.
- 2c. Basal portion of nephridia, showing the compressed fan-shaped nephrostomes or ciliated funnels (CF), $\times 5$. A portion of nerve cord (NC) has been removed; N , thinner-walled portion of nephridium.

PLATE 34

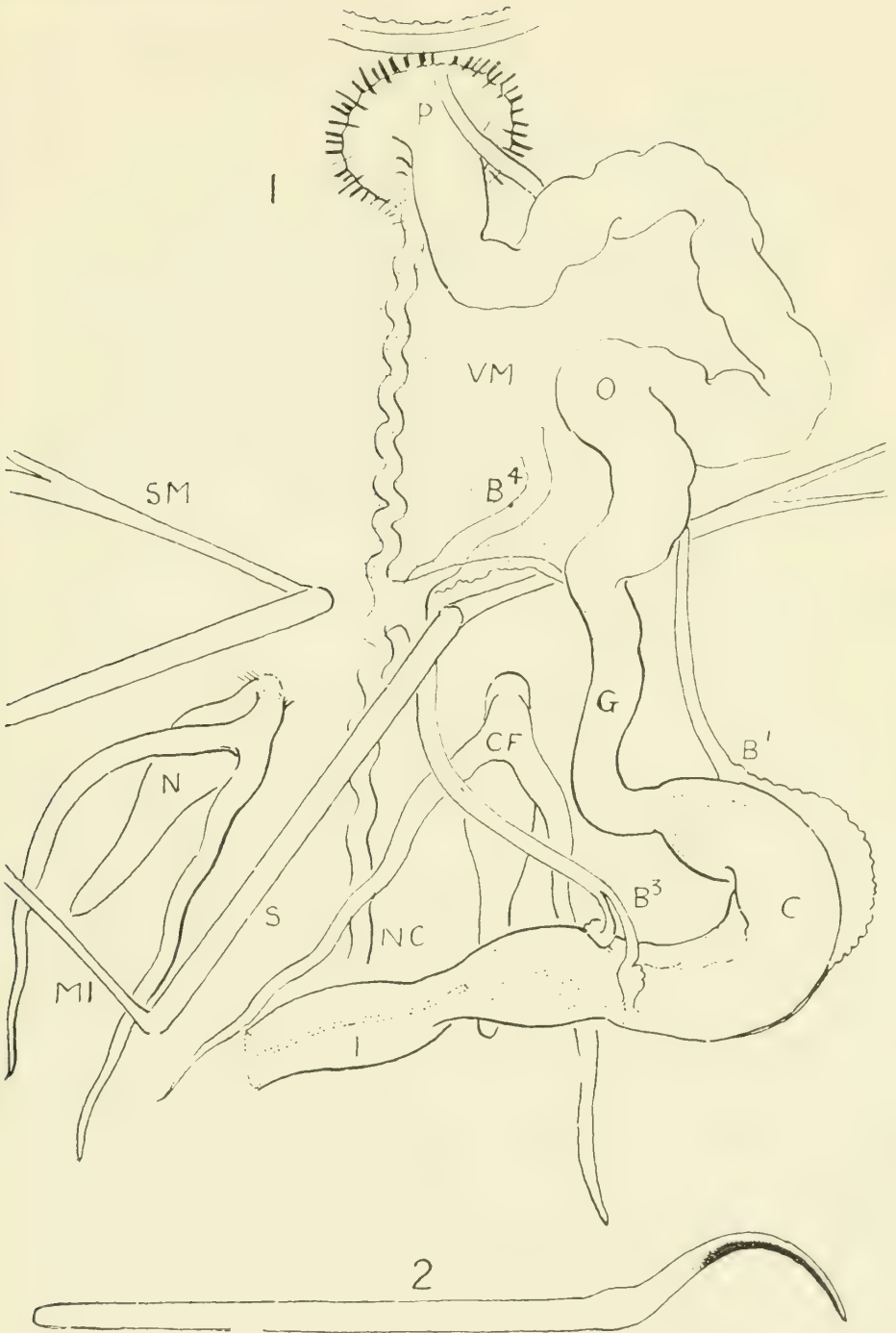
Prometor benthophila Fisher

1. Anterior portion of alimentary canal of paratype arranged to show the different parts of the foregut and circulatory system, $\times 4$. In the natural

position the portion of the dorsal blood vessel, B^1 , attached to esophagus is nearly middorsal. The nerve cord is shown without the close serpentine twisting due to contraction of body wall. (*Go*, ovary.)

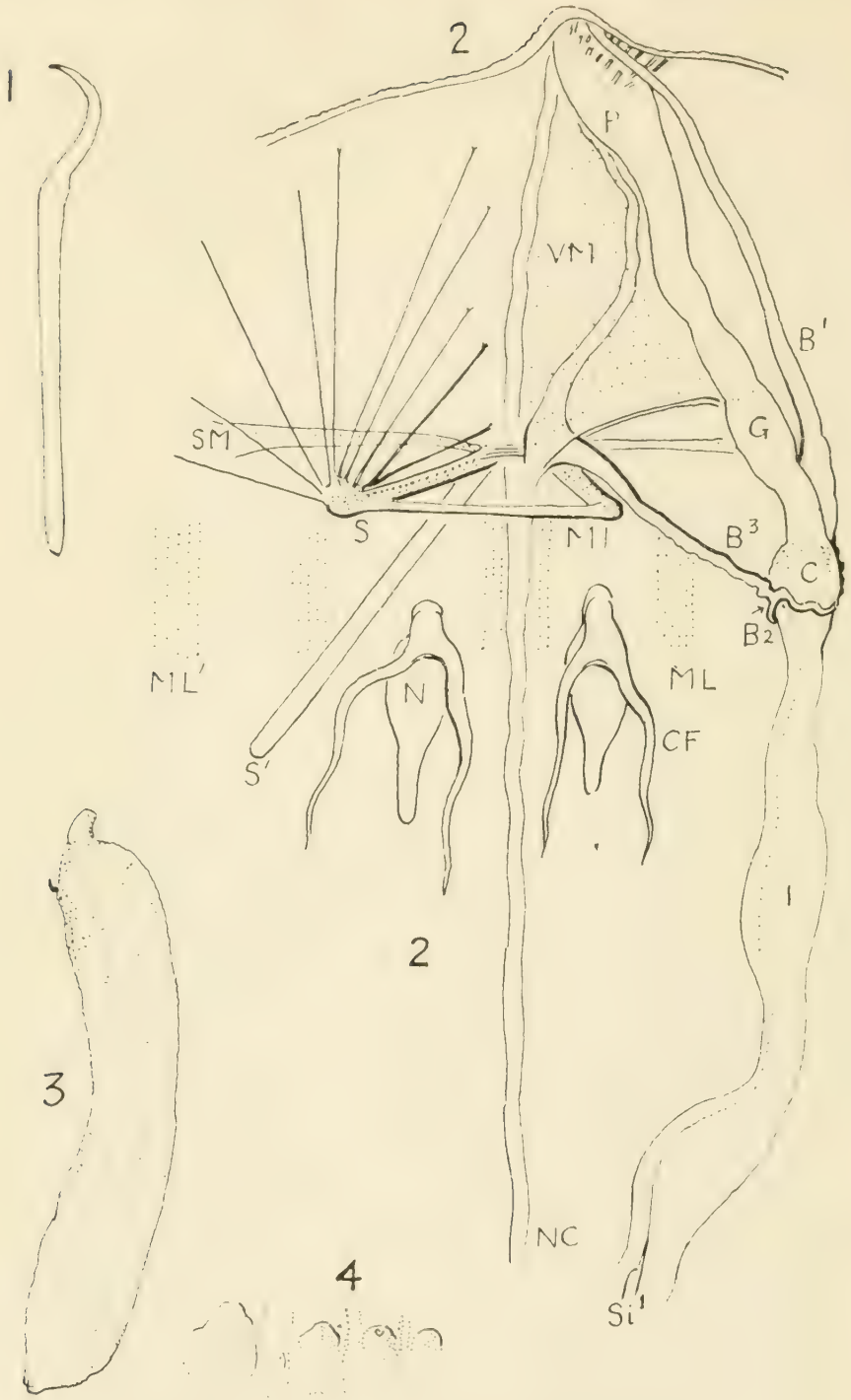
2. Nephridia of type, the proximal portion, due to contraction of body wall, overlapped by the seta apparatus, $\times 4$.
- 2a. Ventral aspect of cloacal complex of type, $\times 3$. The cloaca has been turned backward owing to the attachment of dorsal wall of cloaca to body wall. The anterior end of cloaca is below; the circle indicates passage into intestine which was torn off. *AV* is the anterior lobe of anal vesicle and the numerous villiform nephric tubules normally hang from the underside of the vesicle. Position of anus at *A*.

(Lettering as for plates 28 and 29.)



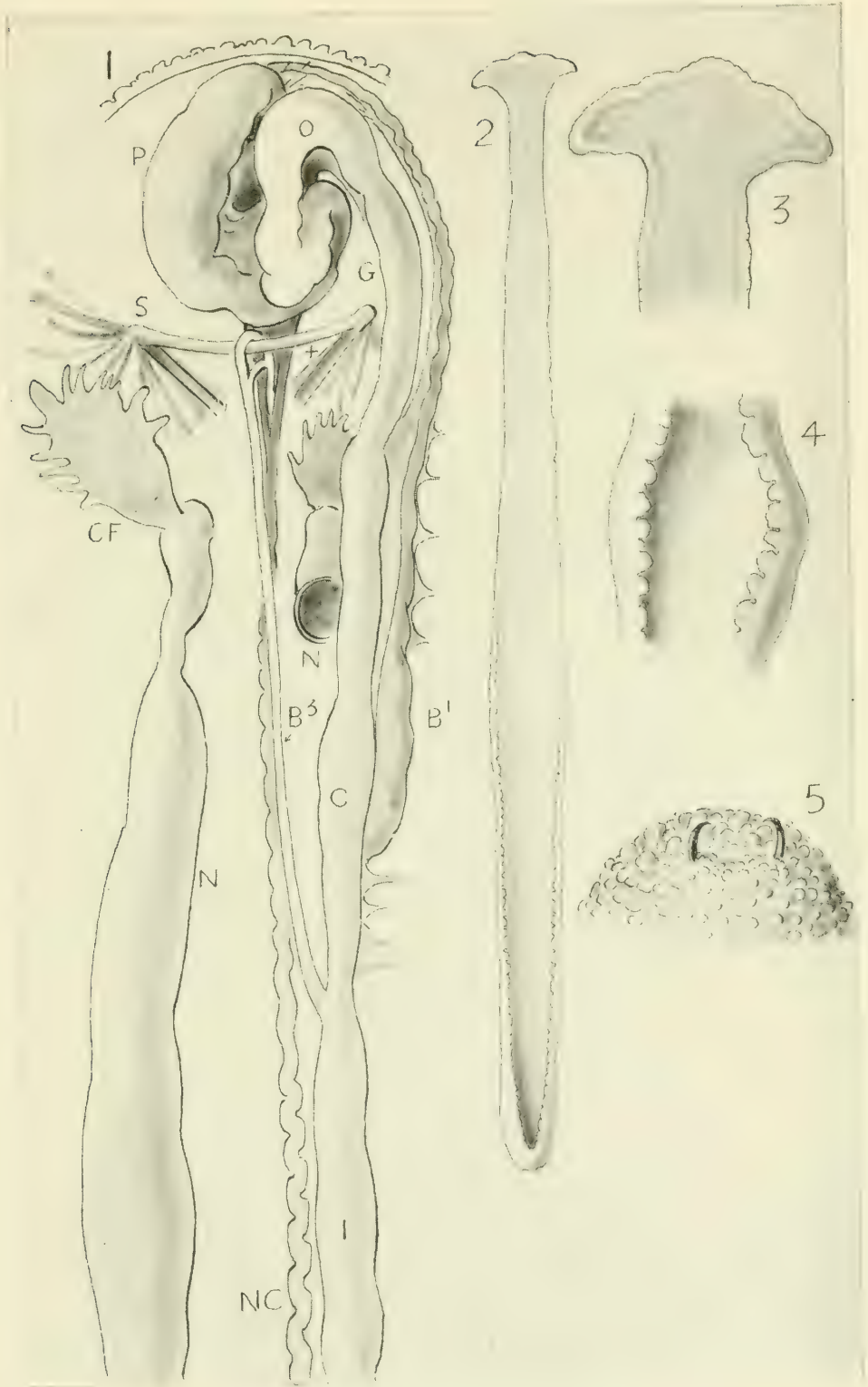
ANELASSORHYNCHUS ABYSSALIS, NEW SPECIES.

FOR EXPLANATION SEE PAGE 495.



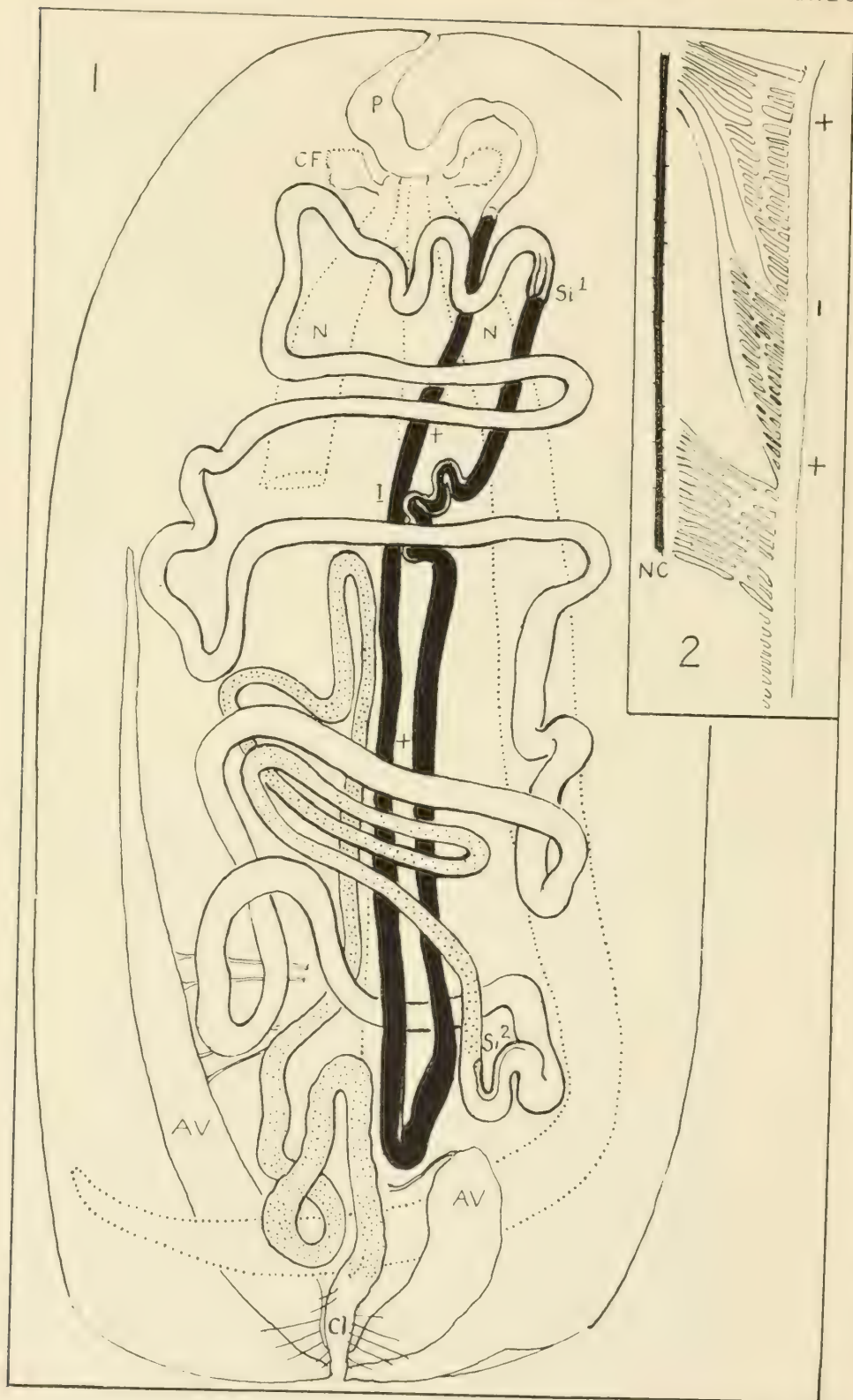
LISTRIOLOBUS HEXAMYOTUS, NEW SPECIES.

FOR EXPLANATION SEE PAGE 495.



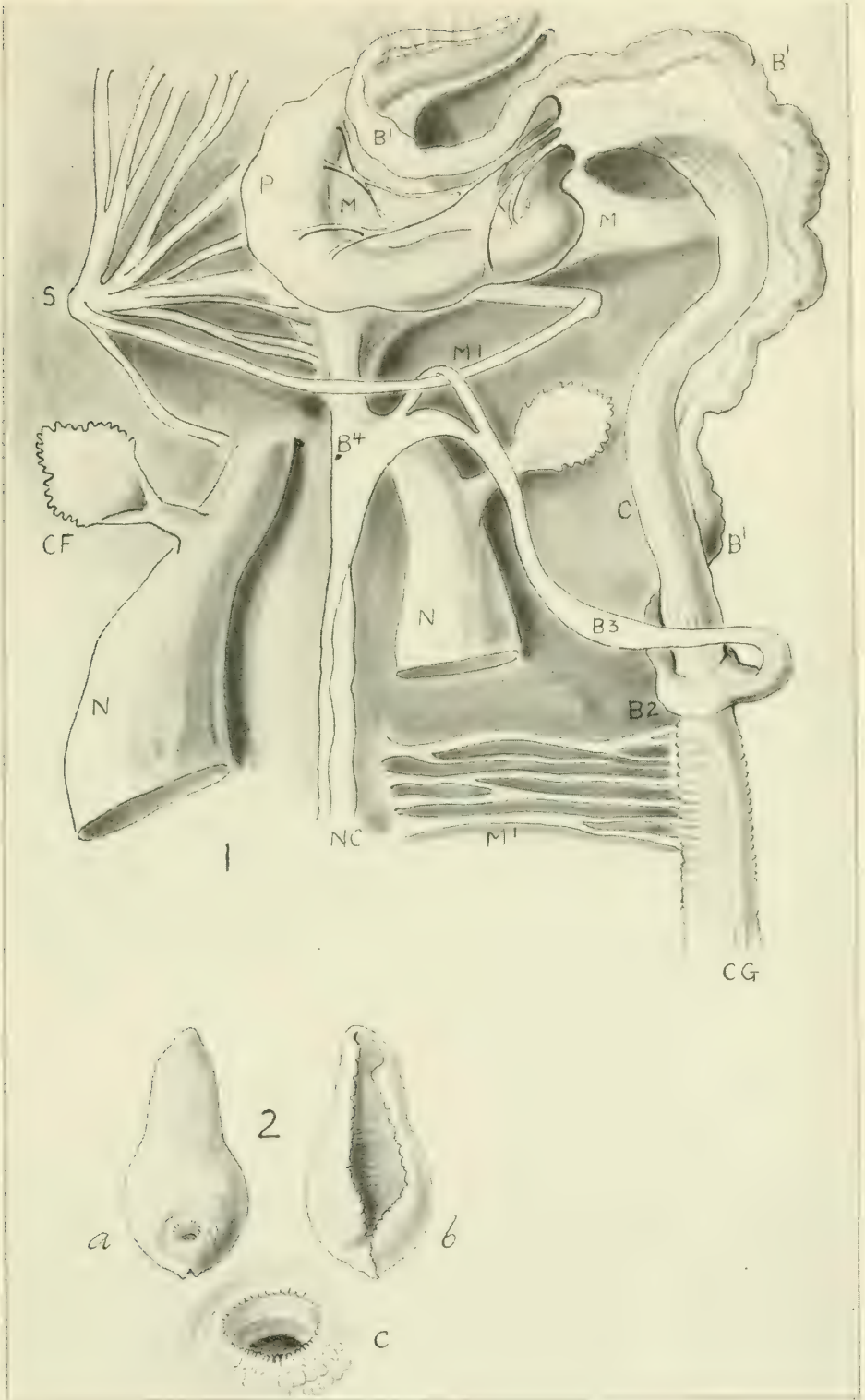
ARHYNCHITE CALIFORNICUS, NEW SPECIES

FOR EXPLANATION SEE PAGES 495-496.



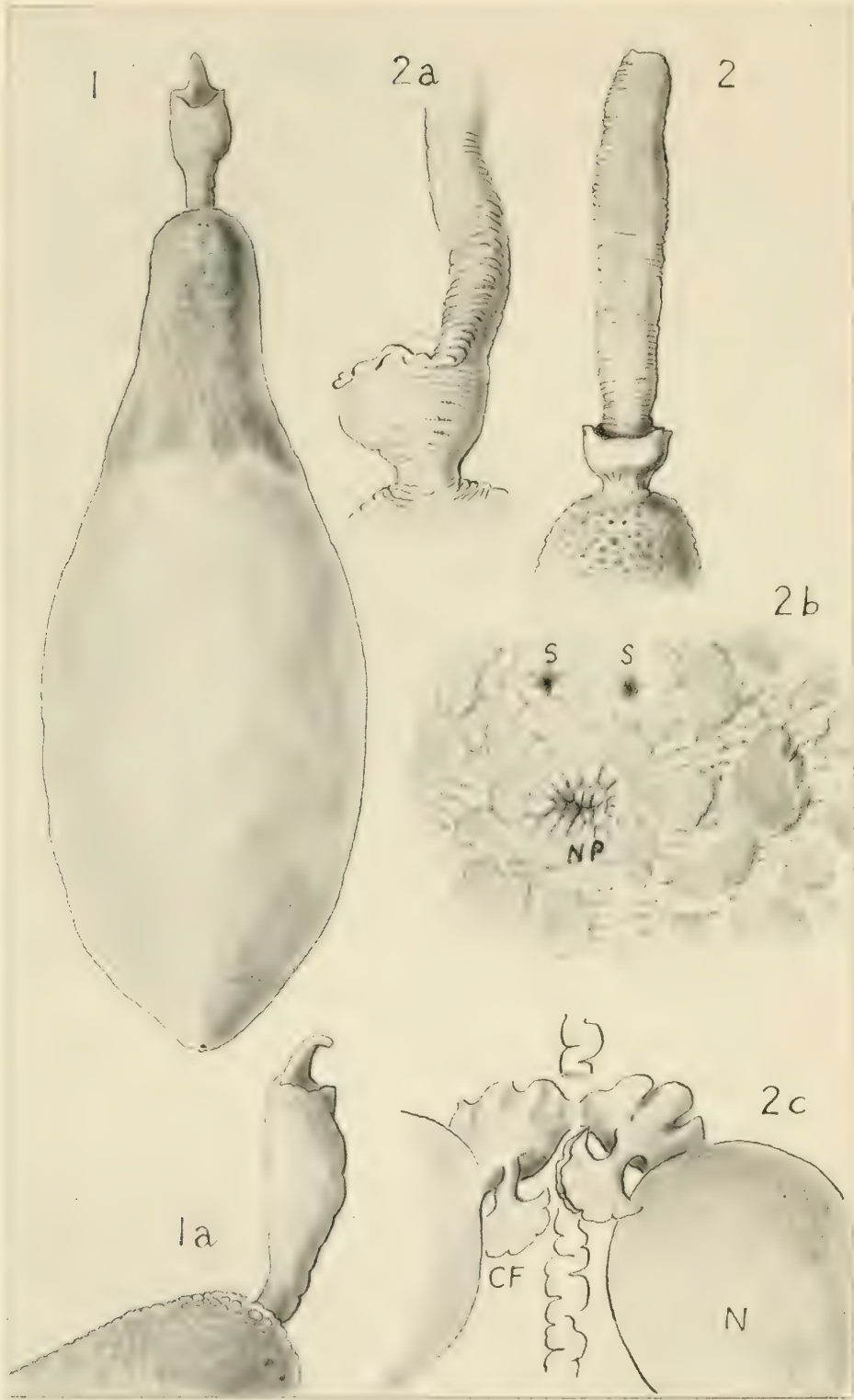
ARHYNCHITE PUGETTENSIS, NEW SPECIES.

FOR EXPLANATION SEE PAGE 496.



ARHYNCHITE PUGETTENSIS, NEW SPECIES.

FOR EXPLANATION SEE PAGE 496.



PROMETOR BENTHOPHILA FISHER.

FOR EXPLANATION SEE PAGE 496.

PROCEEDINGS OF THE UNITED STATES NATIONAL MUSEUM



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A REMARKABLE NEW SPECIES OF TRYPETID FLY OF THE GENUS *CERATITIS* (SENSU STRICTO) FROM EAST AFRICA IN THE COLLECTION OF THE UNITED STATES NATIONAL MUSEUM

By H. K. MUNRO

IN working over a small collection of flies of the family Trypetidae received for identification from the United States National Museum, the writer found a short series of a new species of the genus *Ceratitis* MacLeay, which is here described.

CERATITIS (*CERATITIS*) *CAETRATA*, new species

This small species is the fourth to be placed in *Ceratitis* (*sensu stricto*), but only the second from the African Continent. The males are characterized by the anterior upper orbital bristle that has a flat expansion at the tip; in this species the bristle is very long, 0.9 width of head, and the expansion small, black, and circular. In the medium-sized *capitata* (Wiedemann) the bristle is 0.5 width of head, the expansion black and lozenge-shaped; in *malgassa* Munro from Madagascar, also of medium size, the bristle is 0.5 width of head, the expansion small and white; and in the large *catoirei* Guérin from Mauritius the bristle is 0.7 width of head, the expansion large, shield-shaped, and white.

This species is characterized also by the absence of inferior orbital bristles and the very elongate vertical plates in the male, and in both sexes by the prominent frons and details of coloration, especially of the dorsum of the thorax.

Holotype male, allotype female, U. S. N. M. No. 58820, and two male paratypes, Nairobi, British East Africa, N. L. H. Krauss, April-May 1936 (Kr. 7), from fruits of *Teclea trichocarpa*; one male paratype, Nairobi, British East Africa, May 1936, N. L. H. Krauss, from fruits of *Brucea antidysenterica*. (Two male paratypes of the first series retained in the South African National Collection of Insects.)

Length, male 4.6 mm. (small male 4.0 mm.), female 4.5 mm.; wing, male 4.6 mm. (small male 4.3 mm.), female 4.1 mm

HEAD, male (fig. 39, *a*), length: height: width, 5.5: 8: 10, short, pale yellow behind and below, deeper yellow above and in front; eye, length 0.7 width, somewhat narrowed below; posteriorly broadly black above, beard short, pale, a row of short, brownish, postorbital bristles, postocellars brownish, inner verticals yellowish, the outers black; frons very prominent and swollen anteriorly; seen from above there is posteriorly a large, yellowish, subtranslucent vertical triangle on which is the smaller ocellar dot, black between the ocelli; also translucent are the elongate vertical plates, which extend as far as the anterior edge of the eyes bearing at the front end a moderate tubercle with the very long, flattened, anterior upper orbital bristle, which ends in a relatively small, almost circular, dense black disc set at right angles to the flattening of the stem; the disc is 0.2 mm. in diameter, the total length of the bristle 1.35 mm., 0.9 width of head. The median part of the frons between the vertical plates is opaque, yellow in front, becoming brownish yellow on each side of the vertical triangle; the anterior part before the disc bristles is vertical, and the lower orbital bristles are absent; width of frons 0.7 length at vertex, 0.8 at antennae, 0.35 width of head; ocellars brownish, moderate; very slight, pale pubescence anteriorly and some longer, black on ocellar dot.

HEAD, female, short, narrowed below, length, at antennae 5.5: at epistome 4.0: height 8: width 10; frons yellow, moderately swollen anteriorly and with slight, black pubescence, bristles normal, two lower, two upper orbitals, ocellars strong; male and female, lunule very short; antennae (both lost in female) 0.6 face, second joint with pale setae, third rounded at end, its width 0.6 length, arista short-pubescent above; face wide, flat, yellow, grooves short, moderately deep, cheeks and genae narrow, genal bristle very weak or not differentiated in male, normal, black in female; epistome flat; proboscis yellow, in dry specimen labella apparently of moderate length, about 0.8 length of mouth opening which is rather large and squarish in front; palpi yellow, normal, width 0.4 length.

THORAX: Dorsum (fig. 39, *b*), brown to light ferruginous, moderate gray dust and pale yellow pubescence; dark spots bare, shining, black to blackish brown, yellow areas (dotted) bare, shining; bristles black, normal, one mesopleural, pale hairs on propleura, scapulars pale yel

low; pleura pale ferruginous, gray dust and pale pubescence, hypopleura with a slight, brownish, horizontal, median, weak streak; scutellum moderately swollen, shining black, divided by usual yellow bars, the posterior pair incomplete, apical bristles 0.75 basals, slight pale pubescence on disc; postscutellum, upper part black, lower ferruginous, gray-dusted; squamae pale yellow, of moderate width; halteres yellow; legs yellow, femora deeper yellow, first pair with row of yellow bristles below and yellow hairs above, tibiae paler yellow, yellow clothing, midpair with strong, apical, black spur, tarsi yellow to blackish, with black clothing; wing (fig. 39, *c*), third vein setose to middle of first posterior cell, basal band pale yellow, with pale black outer margins, marginal band mainly black outwardly, cubital black, the two latter not united to basal or very faintly.

ABDOMEN short, yellow, brown pubescence, a band of gray dust on posterior 0.3 of tergum 2, narrowed to sides, and on posterior 0.75 of tergum 4, black apical bristles strong, on penultimate tergum as well in female; ov scape short, 0.5 mm., 0.12 wing length, flat in specimen, yellow, pubescence pale brown; male terminalia not examined.

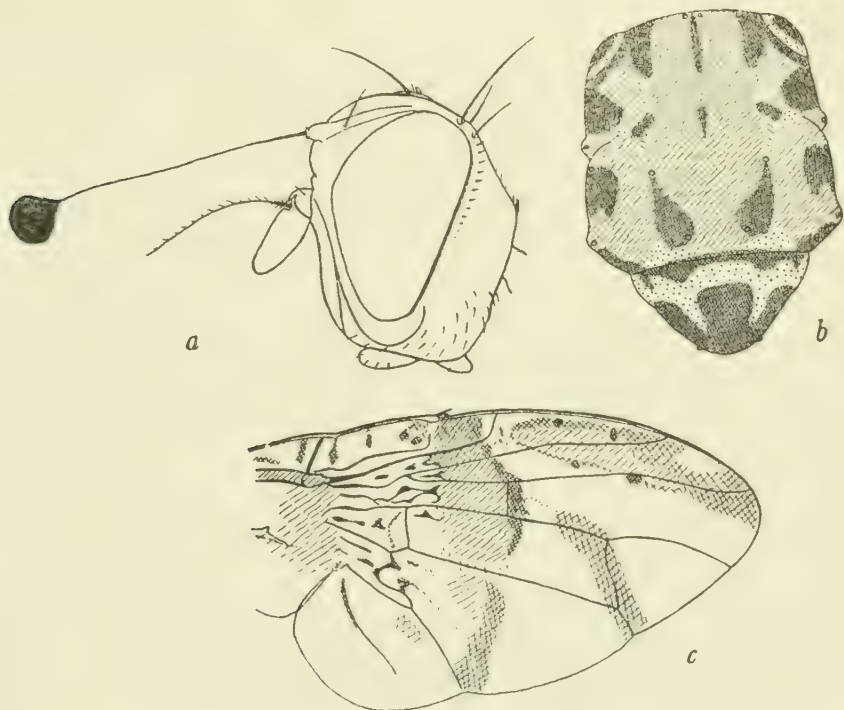


FIGURE 39.—*Ceratitis (Ceratitis) caetrata*, new species: *a*, Head of male in profile, with antenna, arista, and long disc bristle drawn fully extended; *b*, dorsum of thorax; *c*, wing.



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A NEW MARINE ANNELID FROM FLORIDA

By OLGA HARTMAN

SIXTEEN or more species and subspecies of the annelid genus *Sabellaria* Lamarck (family Sabellariidae Johnston) have been named from widely scattered localities. Three are described from New Zealand (Augener, 1926), 2 come from west Africa (Augener, 1918), 2 are from India or Indo-Pacific areas (Gravier, 1909, and Fauvel, 1930), 2 are European (Fauvel, 1927), and 12 are from various parts of the Western Hemisphere (Hartman, 1944). Most species occur in warmer seas and littoral zones. The recovery of yet another one from Florida is the basis of this report. The specimens were collected by Prof. T. A. Stephenson, of the University College of Wales, for whom the subspecies is named. The type collection is deposited in the United States National Museum. The illustrations were drawn by Anker Petersen.

The most conspicuous characters that distinguish the known species of the genus *Sabellaria* from one another are structural features of the opercular paleae, usually designated for their position in outer, middle, and inner rows, although the last two rows are presumed to represent a single one in alternating series. These paleae are segmentally formed setal modifications that arise from notopodial parts of the first several (possibly two) visible segments. These parts are conspicuously shifted forward at the time of metamorphosis so as to lie in front of the oral structures (see fig. 40, *a*). During the life of the individual the paleae are continuously formed as secretions of special cells located at the dorsal end of the setal fascicles, and are replaced, as are other setae. In consequence, younger or smaller in-

dividuals of a single species may have fewer or smaller paleae than larger representatives. Aside from these gradations, there is remarkable uniformity in structure of the different paleae for a particular species.

In other respects the species of *Sabellaria* are closely akin. The body consists of an anterior prolongation or peduncle with a distal operculum; the peduncle may have specific patterns of coloration. The ventral mouth with its accessory parts (oral tentacles and paired palpi) is located at the posterior end and ventral side of the peduncle; it is usually not seen unless the several transverse rows of oral tentacles are pushed aside. This is followed by the thorax, abdomen, and cauda. The thorax consists of two anterior thoracic setigerous segments, represented by neuropodia only, and three biramous parathoracic segments, provided with alternating paleae and slender setae in notopodia and limbate setae in neuropodia. The abdomen consists of a variable number of biramous segments with uncinigerous tori above and slender fascicles of setae below. This is followed by a slenderer, usually cylindrical smooth cauda with a terminal anus. Branchiae are simple, tapering, notopodial prolongations, usually somewhat crenulate at the margins and present on most body segments. All setae are simple but some are modified as paleae or uncini.

TABLE 1.—Comparison of Western Hemisphere species and subspecies of *Sabellaria*

Species or subspecies	Distribution	Distal end of outer paleae	Middle paleae: Uniformly long or alternate	Inner paleae: Distal end
<i>alcocki</i> , ex auctore ¹	French Guiana; southern California.	Closely serrated and prolonged.	Alternate....	Entire.
<i>bella</i> Grube.....	Brazil and Peru.....	Prolonged and serrate.....	Alternate....	Entire.
<i>bellis</i> Hansen.....	Brazil.....	Slightly serrate.....	Uniform....	Serrate.
<i>cementarium</i> Moore.....	Northeast Pacific.....	Penicillate.....	Uniform....	Entire.
<i>fissidens</i> Grube.....	Chile.....	Bifurcate.....	Uniform....	Entire.
<i>floridensis</i> Hartman.....	Southwest Florida.....	Prolonged and strongly serrate.	Alternate....	Serrate.
subspecies <i>stephensoni</i> , new.....	Northeast Florida.....	Shorter and serrate.....	Alternate....	Serrate.
<i>gracilis</i> Hartman.....	Southern California.....	Serrate, approaching penicillate.	Uniform....	Entire.
<i>nanella</i> Chamberlin.....	Central California.....	Smooth spike.....	Uniform....	Entire.
<i>pectinata moorei</i> Monro.....	Balboa, Panama.....	Short serrate.....	Uniform....	Serrate.
<i>spinulosa</i> Leuckart ¹	Balboa, Panama.....	Serrate, approaching penicillate.	Uniform....	Entire.
<i>vulgaris</i> Verrill.....	New England to Georgia.	Long penicillate.....	Uniform....	Entire.
subspecies <i>beaufortensis</i> Hartman.	North Carolina.....	Long penicillate.....	Uniform....	Entire.

¹See Hartman, 1944, p. 339.

Table 1 lists the species and subspecies from the Western Hemisphere, with the distinguishing characteristics of the opercular paleae

and distributional data indicated; more complete bibliographic references are given elsewhere (see Hartman, 1944).

SABELLARIA FLORIDENSIS STEPHENSONI, new subspecies

FIGURE 40

Collection.—Marineland, northern shore of eastern Florida, between tide marks; clump of tubes with many specimens.

The relative proportions of peduncle, thorax, abdomen, and cauda, for a smaller individual, are illustrated in figure 40, *a*. Opercular paleae are straw-colored; the peduncle is dorsally traversed by seven to nine slightly oblique broken bands of dark pigment, which is most intense along the middorsum and extends laterally with diminishing intensity toward the oral tentacular region. Similar though darker pigment spots occur on thoracic and abdominal neuropodia. Cauda and branchiae are paler than the other parts of the body (preserved).

Length of a larger individual is 12 mm., excluding the cauda, which is usually turned under. Setigerous segments consist of two anterior thoracic, three parathoracic, and 20 to 24 abdominal ones. The first two are uniramous; all subsequent ones are biramous, as typical of other species of the genus. The uncinial tori of the last eight setigerous segments are slenderer and longer than the others. The cauda lacks visible annulation; when turned under it extends forward to the twelfth abdominal segment.

The opercular crown has 15 to 17 paired outer paleae, 4 or 5 shorter, and an equal number of alternating longer paired middle, and nine paired inner paleae; the total number in the outer row (30 to 34) is thus about the same as that of middle and inner rows combined. In addition, the dorsal end of the outer row has two pairs of projecting acicular spines (fig. 40, *g*) that project freely and tend to overlap at their distal ends; their embedded bases extend back through the peduncular tissue. The outer paleal row is bound by a circlet of pale, tapering papillae that number about 24; they are smallest and closest together on the dorsal side.

The outer opercular paleae are long, distally serrated (fig. 40, *f*) with about 15 points; their flat surface is nearly smooth. Middle paleae, under low magnification, also appear smooth but under higher power are seen to be delicately spinous. The longer (fig. 40, *e*) and shorter (fig. 40, *c*) are similar to each other except in their distal ends. Inner paleae are delicately spinous along their free portions; they end in a serrated edge (fig. 40, *d*).

Oral tentacles number about five rows on a side, and four to eight in a row; they are crowded and fill the oral area. Individually they are seen to be uniformly slender and ciliated and to have longitudinal

rows of minute pigment spots. The palpi, to be seen by lifting the tentacles, are about as long as the latter but taper from thicker bases to slender tips.

Branchiae occur on all segments except the last few, where tori are long and slender; they are largest in the anterior half of the body and diminish thereafter so as to be absent on about the last ten segments.

Anterior thoracic segments have neuropodia only. The first has a pair of inconspicuous fascicles of very fine slender delicate setae, distally strewn with minute slender hairs. In the second segment the setae are larger and have a serrated limbate region at the free end. They resemble setae of neuropodia farther back.

Parathoracic segments are biramous. Their notopodia have single transverse rows of paleae alternating with slender acicular spines; they number about four pairs in the first, six or seven in the second, and seven or eight in the third segment. The paleae are distally broad and end in long, slender serrations (fig. 40, *b*).

In the abdomen, notopodial tori have uncini in single transverse series; the uncini are very minute though numerous (50 to 100 or more in a row, where best developed). Each is a pectinate plaque with five (fig. 40, *h*) or six teeth in a single row. The cauda is smooth and cylindrical; it ends in a terminal anus.

The tubes are massed to form concreted clumps; they are sufficiently friable to be broken when dropped from a table. Individual tubes measure about 2.3 mm. in outside diameter and 1 mm. or less within. The individual sand grains are uniformly small, largely colorless quartz particles.

S. floridensis stephensoni is nearly related to the stem species from southwestern Florida. In both, the inner opercular paleae are serrated, interpeduncular spines occur at the dorsal end of the operculum, and the middle paleae alternate long and short. In the stem species, however, the outer opercular paleae are distally much longer and more strongly serrated, the peduncle is blotched rather than striped, the over-all size is somewhat greater (14 or 15 mm.), and the body is more robust than in the subspecies.

Others from the Western Hemisphere with serrated inner opercular paleae are distinguished in table 1. There remain *S. pectinata* Fauvel (1928, p. 163) from India, with its variety *intermedia* Fauvel (1932, p. 210) from India, and *S. cementarium* Fauvel (1932, p. 210) from India (not Moore, 1906, p. 248, from the northeast Pacific). The third has outer opercular paleae with a long, smooth, slender spike and middle paleae all short. The first has greatly prolonged, strongly serrated outer paleae, and its variety, *intermedia*, has middle paleae

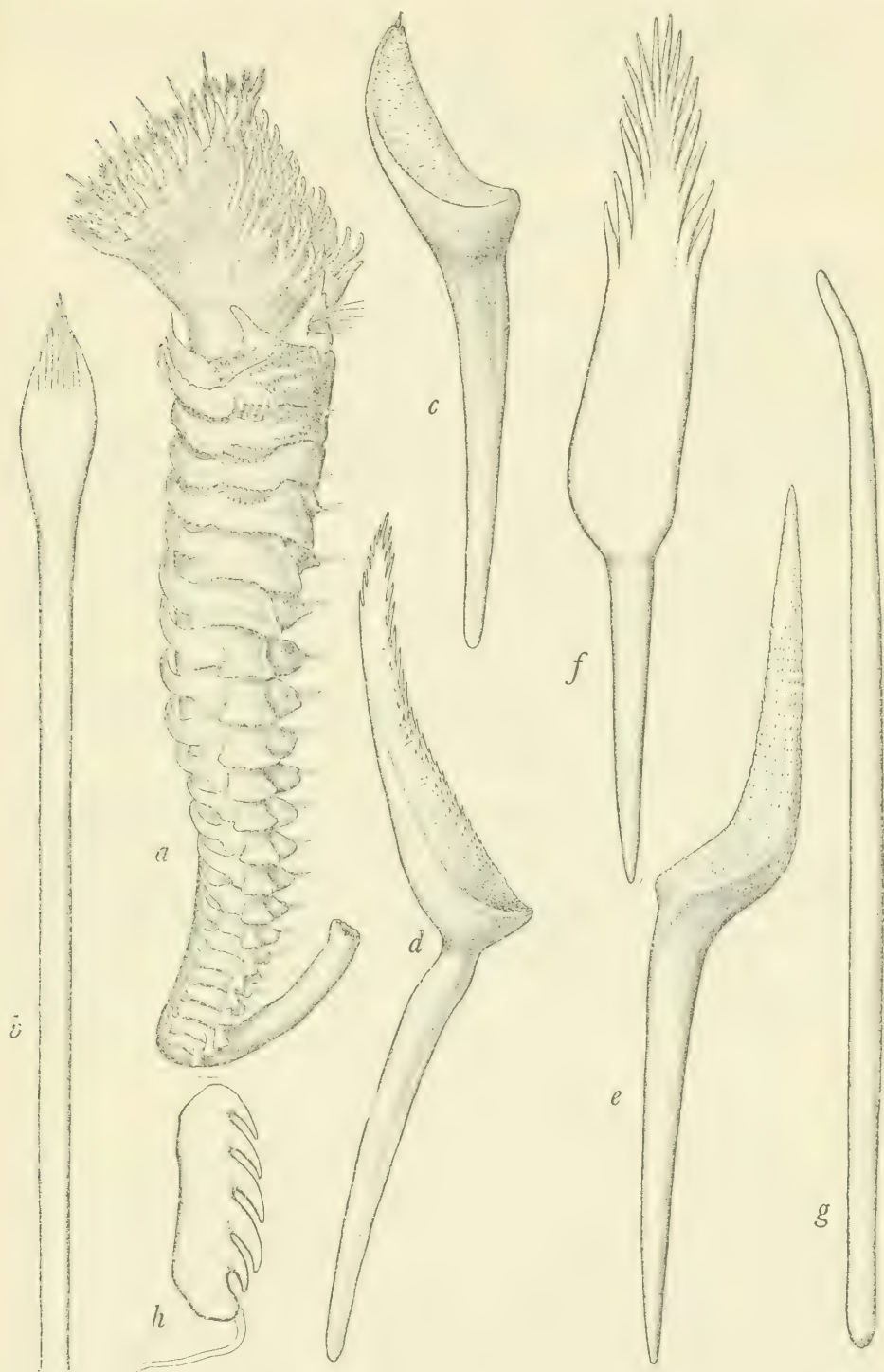


FIGURE 40.—*Sabellaria floridensis stephensoni*, new subspecies: *a*, Entire animal seen from the right side, $\times 16.4$; *b*, notopodial palea from second parathoracic segment, $\times 171.3$; *c*, shorter palea from middle opercular row, $\times 103$; *d*, inner opercular palea, $\times 103$; *e*, longer palea from middle opercular row, $\times 103$; *f*, outer opercular palea, $\times 85.5$; *g*, interpeduncular spine, $\times 103$; *h*, uncinus from abdominal torus, $\times 953$.

that are short and smooth with alternating ones that are long and slightly serrated, and its outer paleae have a short, serrated tip.

Holotype.—U.S.N.M. No. 21114.

Type locality.—Marineland, northern Florida, shore.

Distribution.—Atlantic coast of northern Florida.

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A NEW SPECIES OF APSEUDID CRUSTACEAN OF THE
GENUS SYNAPSEUDES FROM NORTHERN CALIFORNIA
(TANAIDACEA)

By ROBERT J. MENZIES

AN apparently new species of apseudid crustacean is here described from specimens collected at various localities in northern California. For the loan of the Monterey County specimens I am indebted to Dr. Frank A. Pitelka, of the University of California; and for the gift of the San Mateo County specimens Miss Margaret Barr, graduate student at the Pacific Marine Station, Marin County, Calif., deserves special thanks.

This is, to my knowledge, the second record of an intertidal marine apseudid from the California coast, the first being that of *Dalapseudes pedispinis* Boone, which was collected from Laguna Beach, Calif. Specimens of *Synapseudes* can be easily distinguished from those of *Dalapseudes* by their lack of pleopods. Three pairs of pleopods occur in *Dalapseudes* (Boone, 1923, p. 147).

Family APSEUDIDAE

Genus SYNAPSEUDES Miller, 1940

Genotype: *Synapseudes minutus* Miller, 1940, by original designation.

Miller established *Synapseudes* for eye-bearing apseudid Chelifera having a three-segmented pleon and a complete absence of pleopods. His statement (Miller, 1940, p. 313) that "this is also the first case of complete absence of pleopoda in this family" is contradicted by Whitelegge's (1901, p. 213) report of a complete absence of pleopods in some specimens of *Pagurapseudes spinipes* Whitelegge and also by Vanhöffen's (1914, p. 464) similar statement concerning *Pagurapseudes*

heterocheles Vanhöffen. Three species appear to belong in *Synapseudes*. They are *S. minutus* Miller from Hawaii, *S. heterocheles* (Vanhöffen) from Cape Verde Islands, and *S. intumescens*, new species, from California.

SYNAPSEUDES INTUMESCENS, new species

FIGURES 41, 42

Holotype.—Female with partially developed oostegites; length 2.0 mm., width at widest part of third peraeon somite 0.4 mm.

Allotype.—Length 1.6 mm., width 0.4 mm.

Figured paratype.—Female; length 1.6 mm., width 0.6 mm.

Diagnosis.—Eyes lateral, bulging slightly. Rostrum bifurcated. Lateral borders of pleon somites 2 and 3 extending somewhat posteriorly and having truncate apex beset with tuberculations and a seta. Pleotelson with acutely pointed apex, above which is a narrow, cone-shaped, setiferous papilla, lateral and anterior to which are two widely conical setiferous papillae. Inner branch of uropods composed of four segments, outer branch two-jointed. Inner margin of first antenna with conspicuous spines. Second antenna having five segments. Last joint of mandibular palp bearing two ciliated setae.

Character of body.—Entire animal appears elongated and is more attenuated posteriorly than anteriorly. Integument thick, heavily calcified, chalky white in color. Tips of gnathopods black.

Carapace.—Carapace longer than wide; eyes bulging and with a lateral convexity immediately posterior to them. Rostrum bifurcated and margined with sharp tubercles. Two elevated circular swellings are located one on each side of midline posterior to eyes and are followed by a wider pair of perhaps less elevated swellings. Posterior border of carapace widely convex. A single long seta located on each side of carapace posterior to eyes.

Peraeon.—First somite fused with head to form carapace. Second and third somites similar and with a seta and three lateral elevations on each side of midline; margin of first lateral elevation extending the length of second somite and possessing tuberculations at anterior angle; second lateral elevation of second somite similar to first lateral elevation and with tubercles and a seta at anterior angle and tubercles on posterior angle; third lateral elevation (marginal) of second somite longer and larger than second lateral elevation of that somite and possessing tubercles on anterior and posterior border and a seta at its posterolateral angle. Somites 5 and 6 similar, having first lateral elevation margin that does not extend entire length of somite, stopping prior to reaching posterior border; second lateral elevation lacking; third lateral elevation similar to those of prior somites except that those of the fifth and sixth somites possess two setae. Sixth somite

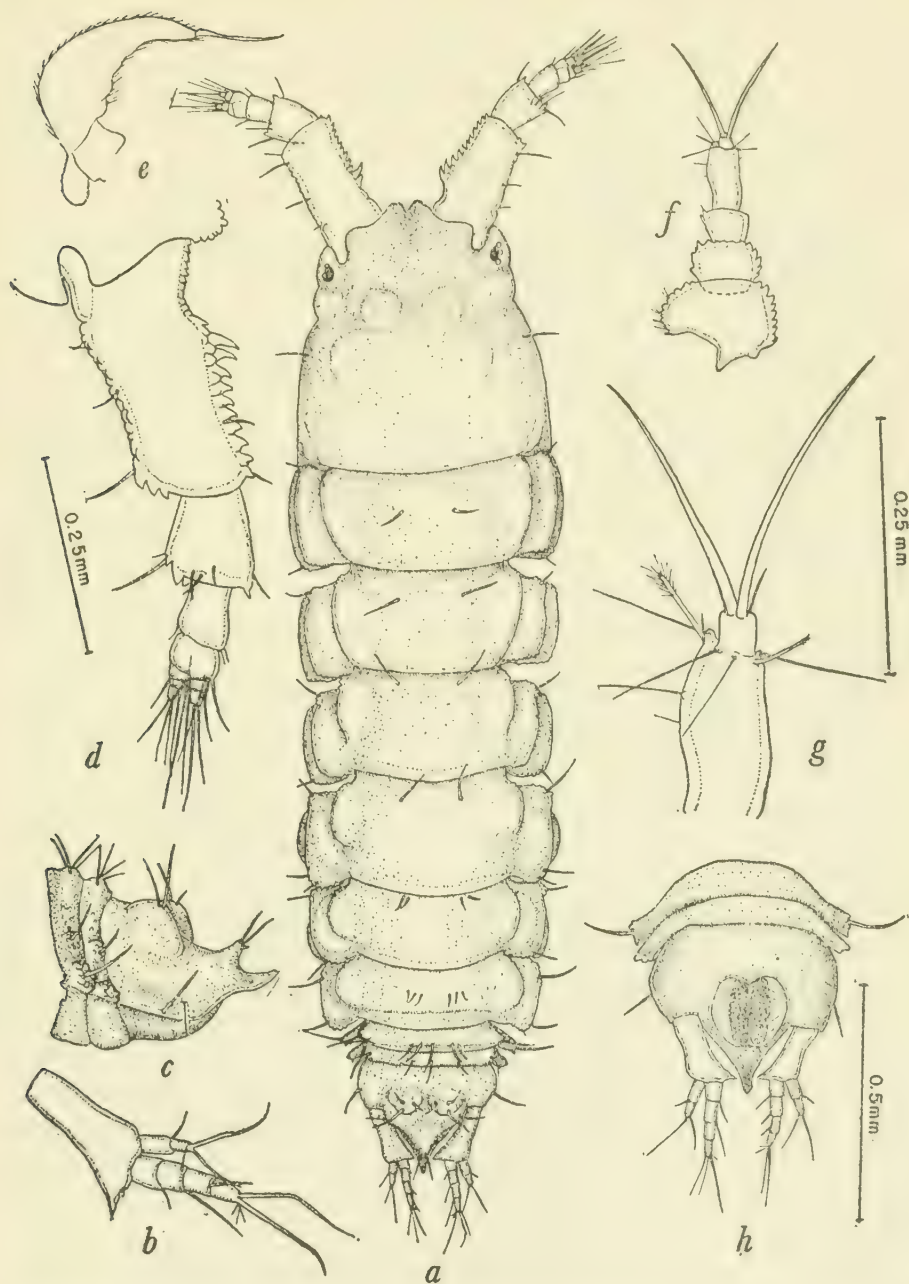


FIGURE 41.—*Synapseudes intumescens*, new species, female paratype: *a*, Dorsal view; *b*, uropod, right; *c*, lateral view of abdomen; *d*, first antenna, right; *e*, gill-like structure within carapace, right; *f*, second antenna, right; *g*, flagellum of second antenna, left; *h*, ventral view of abdomen. (Magnifications: *b*, *d*, *e*, as given for *d*; *c*, *f*, *h*, as given for *h*.)

with one seta at posterior angle of third lateral elevation. Coxal plates of somites five and six not so long as their corresponding somites and visible in dorsal view. Sixth somite possessing two pairs of setae on dorsal surface. Seventh somite similar to sixth but coxal plate not visible in dorsal view and somite with one transverse row of three setae located on each side of midline. An elevated genital papilla present on midventral line of last somite of male specimens.

Pleon.—Composed of three somites, two short anterior somites and a triangulate pleotelson. Lateral border of first and second somites extending somewhat posteriorly and having truncate apex beset with tuberculations and a seta. An elevated, laterally directed papilla bearing a seta at its apex is located medial to each lateral extension. Posterior margin of somites having setae along dorsal portion. Pleotelson with acutely pointed apex, above which is a narrow, cone-shaped, setiferous papilla. Lateral and anterior to that papilla are two widely conical setiferous papillae. No pleopods present. Uropods two-branched, first segment or peduncle extending in length almost to end of pleotelson. Inner uropod branch as long as peduncle and composed of four subequal segments, outer branch two-jointed and one-half the length of inner branch.

First antennae.—First segment thick, three times the length of second, and with a series of large spinelike tubercles on medial margin. Third segment slightly shorter and much narrower than second. Fourth segment about one-half the length of third segment and bearing two branches, the outer of which is composed of three subequal segments, inner branch about as long as fourth segment and composed of two joints. Number of segments of antennal branches is reduced by one in very small specimens. A corresponding reduction occurs in the number of joints to the branches of the uropods.

Second antenna.—Small, located below first antenna and concealed from dorsal view. It is composed of a three-jointed, flattened peduncle whose segments decrease in size distally. First two segments with tuberculate borders. Flagellum composed of two segments the first of which is four times the length of the last. A "sensory" ciliated bristle is located at inner angle of tip of first flagellar segment. Setae at tip of last flagellar segment pointed, not filamentous.

Maxilliped.—With two coupling hooks; palp composed of four articles, the first two of which are wider than endognath. Toothed setae present on medial margin of last three palp segments.

First pair of maxillae.—Composed of two lobes and a biflagellated appendage. Inner lobe with 4 apical setae, outer lobe with 10 apical setae. Biflagellate appendage, which is located external to outer lobe, appears to be two-jointed, last joint bearing two elongate flagellalike spinulate setae, both of which exceed combined length of prior segments.



FIGURE 42.—*Synapseudes intumescens*, new species, female paratype (except where indicated): *a*, Second peraeopod, right; *b*, gnathopod, left; *c*, first maxilla, right; *d*, gnathopod, left (male paratype); *e*, eye region, left; *f*, incisor process, right mandible; *g*, left mandible; *h*, second maxilla; *i*, seventh peraeopod, right; *j*, maxilliped, right. (Magnification: *a*, *b*, *d*, *i*, as given for *a*; all others as given for *c*.)

Second pair of maxillae.—Composed of two lappets. Outer lappet bilobed, outer lobe with six slender setae, inner lobe with four slender setae. Inner lappet with 2 lobes, outer lobe with 3 slender apical setae and 5 stout denticulate setae, inner lobe with 11 slender setae.

Mandible.—Molar process tubular with truncate cutting end having three setae. Palp three-jointed, first two joints subequal in length, third joint about one-third the length of second joint and bearing two elongate spinulate setae at apex. Incisor with toothless knifelike edge. Left mandible with a four-toothed lacina and about five setae in setal row. Right mandible lacking lacina but with a lacinoid seta followed by three setae in setal row.

Gnathopod.—Composed of enlarged and twisted segments. Tips of fingers black. Cutting edge of movable finger with about five teeth (not counting tip of finger as a tooth) in females and young males, adult males with a single large tooth. Cutting edge of immovable finger having about ten subequal teeth in females and young males. In adult males fewer but more enlarged teeth are present. Left and right gnathopods not differing conspicuously in size from one another.

Second peraeopod.—Basis with large spinelike tubercles on superior margin. Ischium set in distal articular margin of basis and scarcely discernible. Merus with thick spine at superior and inferior distal angles, carpus with one thick spine at distal superior and inferior angles, propodus with single thick spine on superior distal angle and four similar spines on inferior border. Dactylus having a single black-tipped claw. Inner distal angles of merus, carpus, and propodus with spinulate setae.

Seventh peraeopod.—Setae much reduced in number. Merus and carpus with a thick seta on distal superior angle. Propodus with two strong setae on inferior margin. Ischium proportionally considerably longer than ischium of second peraeopod. Dactylus more strongly developed than on second peraeopod, tip black.

Type locality.—Tomaes Bluff, Marin County, Calif., south of reef on holdfasts of the alga *Laminaria* sp. and under stones in the laminarian zone of open rocky coast. May 23, 1948.

Material examined.—Specimens were examined that had been collected from the following localities in northern California:

MARIN COUNTY: *Rocks north of Pacific Marine Station*, August 18, 1947, R. J. Menzies, 1 ovigerous female; March 22, 1948, R. J. Menzies, 3 males, 3 females, 1 juvenile; May 12, 1948, R. J. Menzies, 1 female; May 15, 1948, Margaret Barr, 8 females, 3 ovigerous, 2 juveniles; *Tomaes Bluff, bay side*, November 28, 1947, R. J. Menzies, 1 male; May 23, 1948, R. J. Menzies, 2 males, 3 females; *Tomaes Point, ocean side*, August 18, 1947, R. J. Menzies, 1 female, May 23, 1948, 3 males, 3 females; *Tomaes Point, reef*, November 30, 1947, R. J. Menzies, 1 male young; May 23, 1948, R. J. Menzies, 11 males, 19 females, some

ovigerous; June 9, 1948, R. J. Menzies, 11 males, 9 females, 7 ovigerous.

SAN MATEO COUNTY: *Moss Beach*, December 26, 1947, Margaret Barr, 2 males, 1 female with empty marsupium.

MONTEREY COUNTY: *Carmel Cove*, July 18, 1947, T. R. Howell, 1 male, 1 ovigerous female; July 6, 1947, J. Davis, 4 specimens.

Geographical distribution.—Marin County to Monterey County, Calif.

Ecology.—The collections indicate the species to be abundant in and just above the laminarian zone. Specimens were found on the holdfasts of the algae *Egregia*, *Macrocystis*, and *Laminaria*; on the bryozoans *Filicrisia* sp., *Tricellaria occidentalis*, and *Scrupocellaria californica*; on the dorsal surface of the sea-star *Pateria miniata* and the abalone *Haliotes* sp.; and on and under rocks in the laminarian zone. One specimen was collected from a *Mytilus californianus* bed. The species appears most abundant at wave-swept open rocky coast localities.

Reproduction.—Ovigerous specimens were found from May to August inclusive and in December.

Types.—Type specimens are deposited in the following institutions: United States National Museum, female holotype, No. 87416, allotype, figured paratype, and 3 male and 5 female paratypes. Allan Hancock Foundation, 2 male and 2 female paratypes. Pacific Marine Station, 11 male, 19 female, and 1 juvenile paratypes.

KEY TO THE KNOWN SPECIES OF THE GENUS SYNAPSEUDES

- a*¹. Inner border of first joint of first antenna with conspicuous spines.
 - b*¹. Dorsal surface of pleotelson smooth; Cape Verde Islands.
 - heterocheles (Vanhöffen)
 - b*². Dorsal surface of pleotelson with 3 setiferous elevated swellings;
 - California..... intumescens, new species
- a*². Inner border of first joint of first antenna smooth, lacking spines;
 - Hawaii..... minutus Miller

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REDESCRIPTION OF THE SHRIMP BATHYPALAEOMONELLA PANDALOIDES (RATHBUN), WITH REMARKS ON THE FAMILY CAMPYLONOTIDAE

By L. B. HOLTHUIS

IN A paper on brachyuran and macruran decapod Crustacea from the Hawaiian Archipelago, Rathbun (1906) described a new species of shrimp under the name *Palaemon pandaloides*. Kemp (1925) in his key to the species of the genus *Palaemon* (to which he gave the name *Leander*) inserted Rathbun's species under the name *Leander pandaloides* without having access to specimens. Since then the species has not been recorded in the literature.

While working last year in the United States National Museum I had the opportunity, through the courtesy of Dr. Fenner A. Chace, Jr., curator of the division of marine invertebrates, of reexamining the type specimens of *Palaemon pandaloides* and found that they do not belong to the genus *Palaemon* at all, as indicated by the presence of arthrobranchs at the bases of the pereopods. They undoubtedly belong to the family Campylonotidae. Comparison of the specimens with Balss's (1925) description of the genus *Bathypalaemonella* made it clear that *Palaemon pandaloides* belongs in that genus. Rathbun's specimens differ, however, in some respects from Balss's *Bathypalaemonella zimmeri* and so have to be considered to belong to a separate species.

Inasmuch as Rathbun's description is rather short, it is thought that a redescription of this interesting species will be found useful.

Genus **BATHYPALAEEMONELLA** Balss**BATHYPALAEEMONELLA PANDALOIDES** (Rathbun)

FIGURE 43

Palaeomon pandaloides RATHBUN, Bull. U. S. Fish Comm., vol. 23, pt. 3, p. 324, fig. 73, pl. 22, fig. 4, 1906.

Leander pandaloides KEMP, Rec. Indian Mus., vol. 27, p. 290, 1925.

Description.—The rostrum is very long and slender, overreaching the scaphocerite with a large part of its length. The upper margin bears 17 teeth in the proximal half, the distal portion entire except for a subapical tooth. Five or six dorsal teeth of the rostrum are placed on the carapace behind the orbit. The proximal dorsal teeth of the rostrum are shorter and more erect than the distal teeth, which are longer, slenderer, and pressed against the rostrum proper. The lower margin bears 13 teeth, the distals of which are far more widely spaced than the proximals. The carapace is smooth and possesses antennal and branchiostegal spines. The antennal spine is placed slightly below the rounded orbital angle. The branchiostegal spine is situated on the anterior margin of the carapace, just like the antennal. No branchiostegal groove is present. The anterolateral angle of the carapace is rounded.

The abdomen is smooth and has the pleurae of the first five segments broadly rounded. The sixth segment is slightly more than twice as long as the fifth and somewhat shorter than the telson. The telson is elongate and provided with two dorsal pairs of spines, which are placed in the middle and at three-quarters of the length of the telson. The posterior margin of the telson is truncate; it is provided with four pairs of spinules, the outer of which are short, the three inner pairs longer and of equal length.

The eyes are well developed; the cornea is rounded and provided with black pigment.

The antennular peduncle has the stylocerite large and sharply pointed. Slightly above its base the stylocerite is somewhat broadened, and it reaches almost to the middle of the second segment of the peduncle. No anterolateral spine is present at the basal segment of the peduncle. The second segment is somewhat longer than the third. The upper antennular flagellum is slightly thickened at the base and consists of a single ramus.

The scaphocerite is long and slender, almost six times as long as broad. The outer margin is concave. The final tooth is strong and reaches about as far forward as the lamella. The antennal peduncle fails to reach the middle of the scaphocerite. A distinct spine is present near the external side of the base of the scaphocerite.

The oral parts strongly resemble those of *Bathypalaemonella zimmeri* Balss. The incisor and molar processes of the mandible are

fused to one large denticulate plate; a 2-jointed palp is present. The maxillula, maxilla, and first maxilliped do not differ from the figures given by Balss (1925) of those parts of *B. zimmeri*. The second maxilliped has the last joint more slender and more curved than in Balss's species; an epipod and a very large podobranch are present.

The branchial formula runs as follows:

	Maxillipeds			Pereiopods				
	I	II	III	I	II	III	IV	V
Pleurobranchs.....				1	1	1	1	1
Arthrobranchs.....			1	1	1	1	1	
Podobranchs.....		1						
Epipods.....	1	1	1					
Exopods.....	1	1	1					

The first pereiopod is slender and reaches beyond the end of the antennal peduncle, but it fails to reach the end of the scaphocerite. The fingers are short, measuring slightly less than half the length of the palm. The chela is narrow and cylindrical. The carpus is 1.4 times as long as the chela and $1\frac{1}{2}$ times as long as the merus. The ischium is almost as long as the merus. Only one of the second legs is present in the specimens at hand. This leg resembles the first leg, but is longer and slightly stronger. It reaches beyond the scaphocerite. The palm is narrow and cylindrical, 1.7 times as long as the fingers. The carpus is twice as long as the chela and somewhat longer than the merus, which is 1.3 times as long as the ischium. Since in *Bathypalaeomonella zimmeri* the second legs are very unequal in shape and strength, it is to be expected that the same is true for the present species. However, since only one leg is present here nothing can be stated with certainty in that respect. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus is strongly curved and bears on each lateral surface a posteriorly directed spinule near the middle of the posterior margin. The propodus is more than five times as long as the dactylus; it bears some spinules in the distal part of the posterior margin, and many hairs are present there too. The carpus is about as long as the propodus. The merus is almost 1.5 times as long as the carpus; it possesses a large movable spine in the distal part. The ischium is half as long as the merus. The fourth and fifth legs are similar to the third.

The first pleopod of the male has the endopod large and oval in shape. A large part of the inner margin of the endopod is membranaceous and at the inner side provided with minute, strongly curved hooks, thus taking the place of an appendix interna. The second pleopod of the male has the appendix interna and masculina of about the same size.

The uropods are elongate and overreach the telson. The endopod is narrowly ovate. The exopod has the outer margin about straight and ending in a strong tooth, which at its inner side bears a movable spine. No other spinules are present on the exopod.

The male specimen examined by me measures 55 mm., the female 56 mm.

Locality.—The two specimens were collected near Mokuaeae Islet near Kauai Island, Hawaiian Archipelago, 950 meters, bottom fine gray sand and mud, June 12, 1902, *Albatross* station 3992.

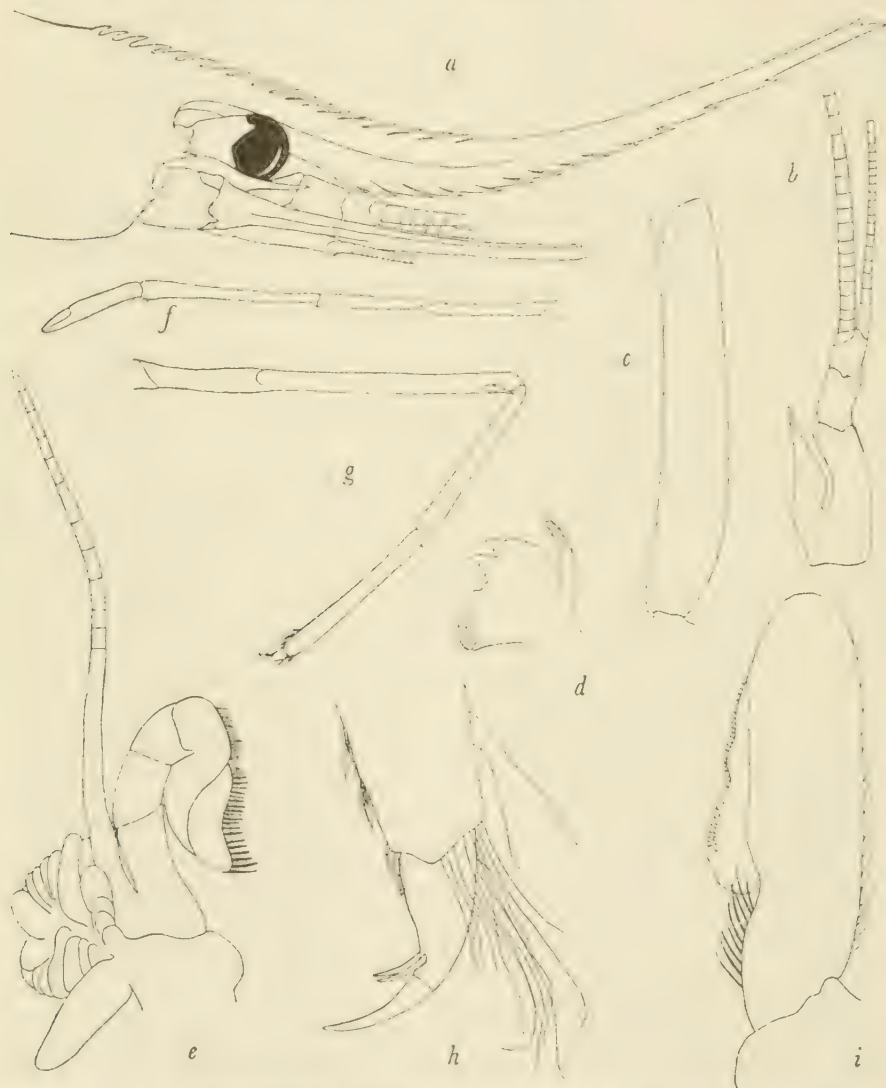


FIGURE 43.—*Bathypalaemonella pandaloides* (Rathbun): *a*, Anterior part of body in lateral view; *b*, antennula; *c*, scaphocerite; *d*, mandible; *e*, second maxilliped; *f*, first pereopod; *g*, third pereopod; *h*, dactylus of third pereopod; *i*, endopod of first pleopod of male. (*a-c*, *f*, *g*, $\times 5$; *d*, $\times 20$; *e*, $\times 13$; *h*, $\times 40$; *i*, $\times 18$.)

Remarks.—The present form is the second species known of the genus *Bathypalaemonella* Balss. It is closely related to *B. zimmeri* Balss but differs from that species in the following respects:

1. The rostrum bears many more teeth. In *B. zimmeri* the rostral formula is $\frac{3)12+1}{10}$. This formula in *B. pandaloides* is $\frac{5-6)17+1}{13}$. Though Balss in his description states that only three teeth of the dorsal margin of the rostrum are placed behind the orbit, his figure shows five there.

2. The scaphocerite in *B. zimmeri* has the anterior inner angle more produced than in *B. pandaloides*.

3. The last joint of the second maxilliped is slenderer in Rathbun's than in Balss's species.

4. The dactylus of the last three pereopods are quite differently built in the two species. In *B. zimmeri* the dactylus is stated to be provided with four or five small denticles at the posterior margin, while in *B. pandaloides* only two denticles are present, which are very curiously placed at the same level, one at each side of the posterior margin of the dactylus.

Unfortunately, both specimens of *B. pandaloides* lack the larger second leg, so that nothing can be said about possible differences in the shape of that appendage in the two species.

Bathypalaemonella zimmeri Balss is known only from the original record, off the east coast of Somaliland, latitude $6^{\circ} 18' N.$, longitude $49^{\circ} 32' E.$, from a depth of 1,079 meters.

In 1925 Balss correctly placed the genus in the family Campylonotidae, after having put it in the family Palaemonidae in 1914. There is no doubt that *Bathypalaemonella* is a campylonotid, but I do not agree with Balss (1925, 1927) and Sollaud (1910, 1913) that this family belongs to the superfamily Oplophoroida Borradaile. Sollaud (1910, 1913) mentions the following points in favor of placing *Campylonotus* in the Oplophoroida:

1. The number of spinules on the dorsal surface of the telson is 8 or 10; in the Palaemonidae this number always should be 4.

2. The upper antennular flagellum is not bifurcated as it is in the Palaemonidae.

3. The mandible is not cleft.

4. The maxillulae have two laciniae, which both are cleft.

5. The palp of the first maxilliped is bi- or tri-articulated.

6. The exopod of the third maxilliped is jointed.

7. The second maxilliped consists of five joints.

8. Arthrobranchs are present on the first four pereopods.

9. Epipods are present at the base of the first four pereopods.

That the character of the number of dorsal spinules is of no importance is shown by the fact that in some Pontoninae there are eight dorsal spinules on the telson (*Periclimenes alcocki* Kemp), while in an

undescribed species of *Pontonia* I found 10 dorsal spinules there. Balss (1925) states the mandible of his *Bathypalaemonella zimmeri* to be distinctly cleft, though the two processes are placed close together. The lower lacinia of the maxilla in the species of *Bathypalaemonella* is strongly reduced, forming thereby a transition between the situation as it is in the Palaemonidae and that in *Campylonotus*. In some species of Palaemonidae a 5-articulated endopod of the second maxilliped may be observed. As to points 2, 8, and 9 above, in the Hippolytidae genera are found that have a bifurcated upper antennular flagellum (e. g., *Lysmata*) and some that are very closely related and have the flagellum single (e. g., *Hippolyssmata*); there are also Hippolytidae with arthrobranchs (e. g., *Ligur*) and others (e. g., *Barbouria*) that lack them, but nevertheless are closely related. In some genera of Hippolytidae some species have and others miss epipods on the pereiopods. In none of the Palaemonidae I examined, however, did I find the palp of the first maxilliped or the exopod of the third maxilliped articulated.

The arguments for a close relationship between the Campylonotidae and the Palaemonidae are the following:

1. The shape of the rostrum in *Campylonotus* (and in a lesser degree also in *Bathypalaemonella*) is distinctly palaemonoid.
2. The first maxilliped has the exopod resembling that of the Palaemonidae and is strongly different from that of the Oplophoridae.
3. The last joint of the second maxilliped is inserted alongside the penultimate joint and not at the top of it.
4. None of the pereiopods bears an exopod.
5. The second legs are much stronger than the first.

Especially the last argument seems very strong in my opinion, as the shape and the relationship of the first and second pairs of pereiopods are of much importance in all the higher groups of Caridea. The character of the presence or absence of exopods is rather variable in the family Atyidae, which belongs to the Oplophoridae.

In my opinion it is much more reasonable to place the family Campylonotidae in the superfamily Palaemonoidea. It then should have to be considered a primitive family in that group.

This superfamily Palaemonoidea must be restricted to the families Campylonotidae, Palaemonidae, and Gnathophyllidae. The families Alpheidae and Hippolytidae, placed by Borradaile (1907) and Balss (1927) in the present superfamily, have to be removed to a separate superfamily. The Palaemonoidea then may be defined as: Caridea with the second legs distinctly stronger than the first, with the carpus of the second legs not articulate, without exopods on the pereiopods, with perfect chelae on the first pereiopods, and with the rostrum immovable.

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THE NEARCTIC SPECIES OF EVANIIDAE (HYMENOPTERA)

By HENRY TOWNES

THE family Evaniidae is an isolated group of parasitic Hymenoptera most closely related to the Serphoidea. It differs from all but a few Hymenoptera in having the abdomen attached near the top of the propodeum instead of down near the coxae, and from these few in abdominal structure as follows: The first abdominal segment is cylindric and slightly arched, and the rest of the abdomen is small, flattened, circular or subcircular or subtriangular, and attached to the first segment by a free articulation. The Evaniidae differ from all other parasitic Hymenoptera in having a long anal lobe at the base of the hind wing.

The species of Evaniidae are parasitic in the egg capsules of Blattidae and are most abundant in the Tropics, where their hosts are commonest. A few species parasitic on domestic cockroaches have been widely distributed by commerce. Two of these species are established in the Nearctic Region, and these together with nine native species constitute our known fauna. The introduced species occur in cities and are frequently collected on the windows of buildings. Of the native species, which are to be found in woods, several are common in the Southeastern United States and occur as far north as southern Canada. West of the humid East, evaniids are occasional along the southern border of the United States, and a single rare species has been taken in central California.

Previous comprehensive papers on the Nearctic Evaniidae include a revision by Bradley (Trans. Amer. Ent. Soc., vol. 31, pp. 137-162, 1908) and a literature compilation by Kieffer (Das Tierreich,

Lief. 30, pp. 6-188, 1912). Persons interested in a complete record of the literature should consult Hedicke (*Hymenopterorum catalogus*, pars 9 (Evaniidae), 1939). Only the original descriptions are cited below in the species bibliographies. The types of the specific names proposed by Ashmead, Bradley, and Kieffer have been studied. The rest have not been available.

The locations of types and of specimens studied from institutional collections are indicated in parentheses by the name of the city in which each collection is located.

KEY TO THE NEARCTIC GENERA OF EVANIIDAE

1. Forewing with only 3 strong longitudinal veins (costal, subcostal, and medial) and only one closed cell (subcostal); second and third tergites covering all or nearly all the gaster; notaulus extending less than 0.6 length of mesoscutum, usually absent.....*Hyptia*
Forewing with numerous veins enclosing eight cells; second and third tergites enclosing basal $0.6\pm$ of gaster; notaulus complete..... 2
2. Submedian to subbasal constricting groove on hind coxa interrupted on ventrolateral face of coxa; base of middle coxa separated from base of hind coxa by about 2.0 length of middle coxa; metasternum large and rather evenly convex; hind coxa beneath with a curved longitudinal carina next to metasternal fork (not visible when coxa is turned outward); shoulders of pronotum rounded, without a sharp transverse ridge; mediellian vein strong for about 0.9 distance to wing margin.....*Evania*
Submedian to subbasal constricting groove on hind coxa not interrupted on ventrolateral face of coxa, completely encircling coxa; base of middle coxa separated from base of hind coxa by about 1.0 to 1.5 length of middle coxa; metasternum smaller; hind coxa beneath without a curved longitudinal carina next to metasternal fork, but sometimes with a curved groove in that position; shoulders of pronotum with a sharp transverse ridge; mediellian vein distinct for less than 0.8 distance to wing margin..... 3
3. Hind coxa beneath with a curved longitudinal groove next to metasternal fork (not visible when coxa is turned outward; this groove should not be confused with transverse coxal constriction); lower part of frons with a lateral longitudinal carina that curves around outside of antennal socket to approach or reach midline on upper part of face; second intercubital vein (a very weak vein) meeting radial cell near its distoventral angle; mediellian vein distinct to beyond middle of wing (except in a few exotic species); forewing of Nearctic species 5.5 to 7.5 mm. long.....*Prosevania*
Hind coxa beneath without a longitudinal groove next to metasternal fork; lower part of frons without a lateral longitudinal carina; second intercubital vein (a very weak vein) meeting radial cell considerably basad of its distoventral angle; mediellian vein not distinct to middle of wing; forewing of Nearctic species 4.0 to 5.0 mm. long.....*Evaniella*

Genus EVANIA Fabricius

Evania FABRICIUS, *Systema entomologiae*, p. 345, 1775. Type: *Ichneumon appendigaster* Linnaeus. Designated by Curtis, 1829.

As defined in the key, *Evania* is a much more restricted and compact genus than as used by other authors. Most of the species that they

refer to *Evania* belong properly in *Prosevania*, *Evaniella*, *Szepligetella*,¹ and *Acanthinevania*.

In the Nearctic Region *Evania* in the strict sense contains only the introduced *E. appendigaster*. Most of the other species of the genus are Oriental.

EVANIA APPENDIGASTER (Linnaeus)

Ichneumon appendigaster LINNAEUS, *Systema naturae*, ed. 10, p. 566, 1758. Type: Hispanic America (location unknown).

Evania unicolor SAY, in Keating, Narrative of an expedition to the source of St. Peters River, etc., vol. 2, p. 320, 1824; LeConte ed., vol. 1, p. 214. Types: Pennsylvania and near Rocky Mountains (destroyed).

The large size of this species (forewing 5.5 to 7.0 mm. long) makes it superficially similar only to *Prosevania punctata* among the Nearctic species. It may be distinguished from this species by its smooth face, with fine, rather sparse punctures, and by the pleura with rather sparse, very large separate punctures rather than close, large, reticulate punctures.

Specimens.—Many males and females from ARIZONA (Globe, Santa Rita Mountains, Tempe, and Tucson); DISTRICT OF COLUMBIA (Washington); FLORIDA (Arcadia, Fort Myers, and Jacksonville); GEORGIA (Atlanta and Thomasville); LOUISIANA (Baton Rouge); NEW YORK (Long Island and New York City); PENNSYLVANIA (Philadelphia); TENNESSEE (Memphis); and TEXAS (Dallas, El Paso, Houston, San Antonio, and 20 miles north of San Antonio). Most of these specimens were taken during the summer months. Those of other dates are: April 6 at Arcadia, Fla.; April 22 at Fort Myers, Fla.; May 23 at Philadelphia, Pa.; May 28 at Baton Rouge, La.; September 6 at Dallas, Tex.; and December at Philadelphia, Pa. The earliest Nearctic record of capture on this material is a specimen from Washington, D. C., taken June 5, 1879, but Say's record of the presumably synonymous *Evania unicolor* is much earlier.

This species is probably of Oriental origin, but it now occurs in most of the tropical and subtropical parts of the world. In the United States it is common in Arizona and in the cities of the Gulf and Atlantic States as far north as New York City. In other parts of the world it has been reared from the egg capsules of *Blattia orien-*

¹ *Szepligetella* Bradley, 1908, was erected as a monotypic endemic genus for the Hawaiian *Evania sericea* Cameron. *E. sericea* is not an endemic of Hawaii, as I have seen specimens of it also from New Guinea, Fiji, the Philippines, the Marquesas, Kapingamarangi, Bikini, Swains Island (north of Samoa), and Tahiti. It was recorded from the New Hebrides by Cheesman in 1936. A specimen I collected on Kapingamarangi was flying about the eaves of a native house of *Pandanus* thatch. In view of this and its distribution, it seems probable that *sericea* is parasitic on a blattid living in *Pandanus* thatch and with its host was widely spread by migrations of the Polynesians and other natives. In the U. S. National Museum are five additional species of *Szepligetella*, all from Australia.

talis and *Periplaneta* spp., and these are doubtless its hosts in the United States also.

Genus PROSEVANIA Kieffer

Prosevania KIEFFER, Ann. Soc. Ent. France, vol. 80, p. 157, 1911. Type: *Evania* (*Prosevania*) *afra* Kieffer. Designated by Viereck, 1914.

As defined in the key, *Prosevania* is a large genus of the Old World Tropics. A single introduced species is common in the cities of the Eastern United States.

PROSEVANIA PUNCTATA (Brullé), new combination

Evania punctata BRULLÉ, Expédition scientifique de Morée, vol. 3, p. 378, 1833.

Type: Greece (? Paris).

Evania urbana BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 140, 1908. Type: ♂, Philadelphia, Pa. (Philadelphia).

This species differs from most others of its genus in its more robust thorax, shoulder carina of pronotum extending downward on each side nearly to the lower corner of the pronotum; shoulders of pronotum rather rounded; and speculum not reaching the front edge of the mesopleurum but bounded anteriorly by some fine punctures. Among the Nearctic evaniids, its large size (forewing 5.5 to 7.5 mm. long) makes it superficially similar only to *Evania appendigaster*, but in addition to the generic characters it is easily distinguished from that species by its coarsely striatopunctate face and its pleura reticulatopunctate except at the speculum.

Specimens.—Many males and females from DELAWARE (New Castle County); DISTRICT OF COLUMBIA (Washington); GEORGIA (Atlanta); NEW JERSEY (Newark and Plainfield); NEW YORK (Brooklyn, Flatbush, Ithaca, Long Island, New York, and Yonkers); NORTH CAROLINA (Elizabeth City); OHIO (Columbus); PENNSYLVANIA (Harrisburg and Philadelphia); and VIRGINIA (Falls Church, Norfolk, and Roanoke). Collecting dates for these specimens range throughout the growing season. The first record of capture in the Nearctic Region is a specimen taken in Washington, D. C., August 29, 1898, by F. C. Pratt.

This species is a native of the Mediterranean Region and is naturalized in the cities of the Eastern United States from New York and Ohio south to Georgia. Though no rearing records are available, the large size of the species and its occurrence in cities indicate that it is a parasite of *Periplaneta* spp. and *Blatta orientalis*.

Genus EVANIELLA Bradley

Evaniella BRADLEY, Can. Ent., vol. 37, p. 64, 1905. Type: (*Evania unicolor* Say as misdetermined by Ashmead) = *scmacoda* Bradley. Original designation.

This is a large genus of the Neotropics and is represented also in the Australian Region. Three species occur in the Nearctic Region, one widespread in the Eastern United States and the other two restricted to New Mexico and California.

KEY TO THE NEARCTIC SPECIES OF EVANIELLA

1. Cheek about 1.0 as long as height of eye; coloration almost uniformly reddish brown----- 3. *californica* (Ashmead)
- Cheek about 0.3 as long as height of eye; coloration partly or entirely black----- 2
2. Head about 1.0 as wide as thorax; temple with rather close, large punctures; thorax entirely black to entirely ferruginous, when only partly ferruginous this color present on front part of thorax, hind part black.
 1. *semaeoda* Bradley
 - Head about 0.8 as wide as the thorax; temple with sparse small punctures; thorax black anteriorly, ferruginous posteriorly.
 2. *neomexicana* (Ashmead)

1. EVANIELLA SEMAEODA Bradley

Evaniella semaeoda BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 144, 1903.
Type: ♂, Browns Mills, N. J. (Ithaca).

Forewing about 4.8 mm. long; head about 1.0 as wide as the thorax; cheek about 0.3 as long as the height of the eye; mandible without a posterior ventral tooth; frons and temple with close large punctures; mesoscutum with numerous large punctures, closely spaced on the median lobe and sparse on the lateral lobes; shoulder carina of pronotum strong, continuous across the midline and laterally curved backward to near the hind margin of the pronotum below the tegula; subdiscoidal vein weak, unpigmented; first tergite with very fine punctures, in the female with very sparse, large punctures also.

The color varies from nearly all black to nearly all but the gaster ferruginous. Blackish specimens have the legs a little paler than the body; tegula and front tibia and tarsus ferruginous; scape and front femur brownish ferruginous; basal part of first trochanter of hind legs stramineous; and basal four segments of female antenna stramineous to brownish ferruginous. Commonly the pronotum and mesoscutum are ferruginous and the apical part of the first tergite stramineous. In the most extensively ferruginous specimens only the gaster is blackish, and the flagellum of the male and all but the basal three flagellar segments of the female dark brown. The head and hind legs are among the last parts to be invaded by ferruginous.

Specimens.—Many males and females from FLORIDA (Crescent City, Lakeland, Orlando, Pablo Beach, and Zolfo Springs); GEORGIA (Okefenokee Swamp and Tifton); KANSAS (Baldwin); LOUISIANA (Tallulah); MARYLAND (Plummers Island and Takoma Park); MICHIGAN (Livingston County); NEW JERSEY (Jamesburg, Moorestown, and

Wenonah); NEW YORK (Cold Spring Harbor, Farmingdale, and Riverhead); PENNSYLVANIA (Gladwyn); RHODE ISLAND (North Kingston and Westerly); and VIRGINIA (near Washington D. C., Falls Church, Mount Vernon, and New Church).

Practically all the dates of capture are from June 19 to August 4. Dates outside of this range are August 10 at Orlando, Fla.; August 22 at Lakeland, Fla.; and August 26 at Okefenokee Swamp, Ga. This seasonal distribution indicates a single generation a year.

This species occurs in the Lower and Upper Austral Zones of the United States from the Atlantic west to Michigan and Kansas. Along the Atlantic coast it ranges north to Long Island and Rhode Island, and in the Central States to Livingston County, Mich.

2. *EVANIELLA NEOMEXICANA* (Ashmead)

Erania Neomexicana ASHMEAD, Can. Ent., vol. 33, p. 304, 1901. Lectotype hereby selected: ♂, Las Cruces, N. Mex., September 9 (Washington).

Forewing about 4.0 mm. long; head about 0.8 as wide as the thorax; cheek about 0.3 as long as the height of the eye; mandible without a posterior ventral tooth; frons with rather close, moderately small punctures; temple with sparse medium-sized punctures; shoulder carina of pronotum continuous across the midline, extending laterad to the front end of the notaulus; mesoscutum with interspersed sparse medium-sized punctures and closer fine punctures; subdiscoidal vein weak, unpigmented; first tergite with very sparse small punctures.

Black or piceous. Lower 0.6 of mesepisternum, all the metapleurum except its upper section and all the propodeum except basad of and above the abdominal socket, ferruginous.

Specimens.—Redescribed from the types: a male from Las Cruces, N. Mex., T. D. A. Cockerell (Washington), and a male from Las Cruces, N. Mex., September 9 (Washington).

3. *EVANIELLA CALIFORNICA* (Ashmead)

Erania Californica ASHMEAD, Can. Ent., vol. 33, p. 304, 1901. Type: ♂, Natoma, Calif. (Washington).

Forewing about 3.5 mm. long; head about 1.0 as wide as the thorax; cheek about 1.0 as long as the height of the eye; mandible without a posterior ventral tooth; frons and mesoscutum with fine rather sparse punctures; temple with very fine sparse punctures; shoulder carina of pronotum present only near the front end of the notaulus, not continuous across the midline nor extending laterad beyond the inner edge of the tegula; subdiscoidal vein weak, unpigmented; first tergite with fine punctures.

Reddish brown. Mandible, lower part of face, and all but upper part of clypeus yellowish brown.

Specimen.—Redescribed from the type male from Natoma, Sacramento County, Calif., July 7, 1895 (Washington).

Genus **HYPTIA** Illiger

Hyptia ILLIGER, Mag. Insekt. (Illiger), vol. 6, p. 192, 1807. Type: *Erania peticolata* Fabricius. Monobasic.

Hyptiam SHUCKARD, Entomologist, vol. 1, p. 120, 1841. Emendation.

This genus is easily distinguished from others in the Nearctic Region by the partial or complete absence of the notaulus and by the reduced venation. Only the subcostal cell of the forewing is enclosed. The species are restricted to the New World, with most of them in the Neotropics.

The Nearctic species vary considerably in color, which has led to the creation of some synonyms. All six may have the head, thorax, and first tergite either entirely black or partly to entirely ferruginous. The forward and upper parts of the thorax are the regions most frequently ferruginous, and the ferruginous coloration is most frequently and extensively developed in specimens from the southern parts of the ranges of the various species.

Our species are on the wing mostly in midsummer and, at least in the North, seem to have a single generation a year. Adults occur in woods. The commoner species (*thoracica*, *reticulata*, and *harpyoides*) are probably all parasites of *Parcoblatta* spp., though the rearing data are scanty.

KEY TO THE NEARCTIC SPECIES OF *HYPTIA*

1. Mesoscutum about 0.54 as long as wide; forewing about 2.3 mm. long; lower part of mesopleurum with only fine punctures or with a very few coarse ones (fig. 44, *e*)----- 5. *floridana* Ashmead
- Mesoscutum 0.65 to 0.95 as long as wide; forewing 2.5 to 4.8 mm. long; lower part of mesopleurum with scattered large coarse punctures (fig. 44, *a-d, f*) - 2
2. Mesopleurum near its upper posterior margin with oblique rugae (fig. 44, *f*); mesoscutum about 0.90 as long as wide; forewing 2.6 to 3.7 mm. long----- 6. *oblonga*, new species
- Mesopleurum near its upper posterior margin without oblique rugae (fig. 44, *a-d*); mesoscutum 0.65 to 0.8 as long as wide; forewing 3.5 to 4.8 mm. long----- 3
3. Median posterior corner of mesopleurum not containing a subcircular depression, though often with a group of depressions nearby (fig. 44, *a, b*)----- 4
- Median posterior corner of mesopleurum containing a subcircular depression (fig. 44, *c, d*)----- 5
4. Punctures on frons so close that they are angular and separated by sharp ridges; hind femur beneath with rather dense small weak punctures----- 1. *harpyoides* Bradley
- Punctures on frons so distant that they are not angular, and the separating areas are rounded or flattened ridges; hind femur beneath with sparse, large, weak punctures----- 2. *thoracica* (Blanchard)
5. Femora black; lower swelling of mesopleurum with a few moderately large punctures (fig. 44, *c*)----- 3. *reticulata* (Say)
- Femora ferruginous; lower swelling of mesopleurum with many large punctures (fig. 44, *d*)----- 4. *femorata*, new species

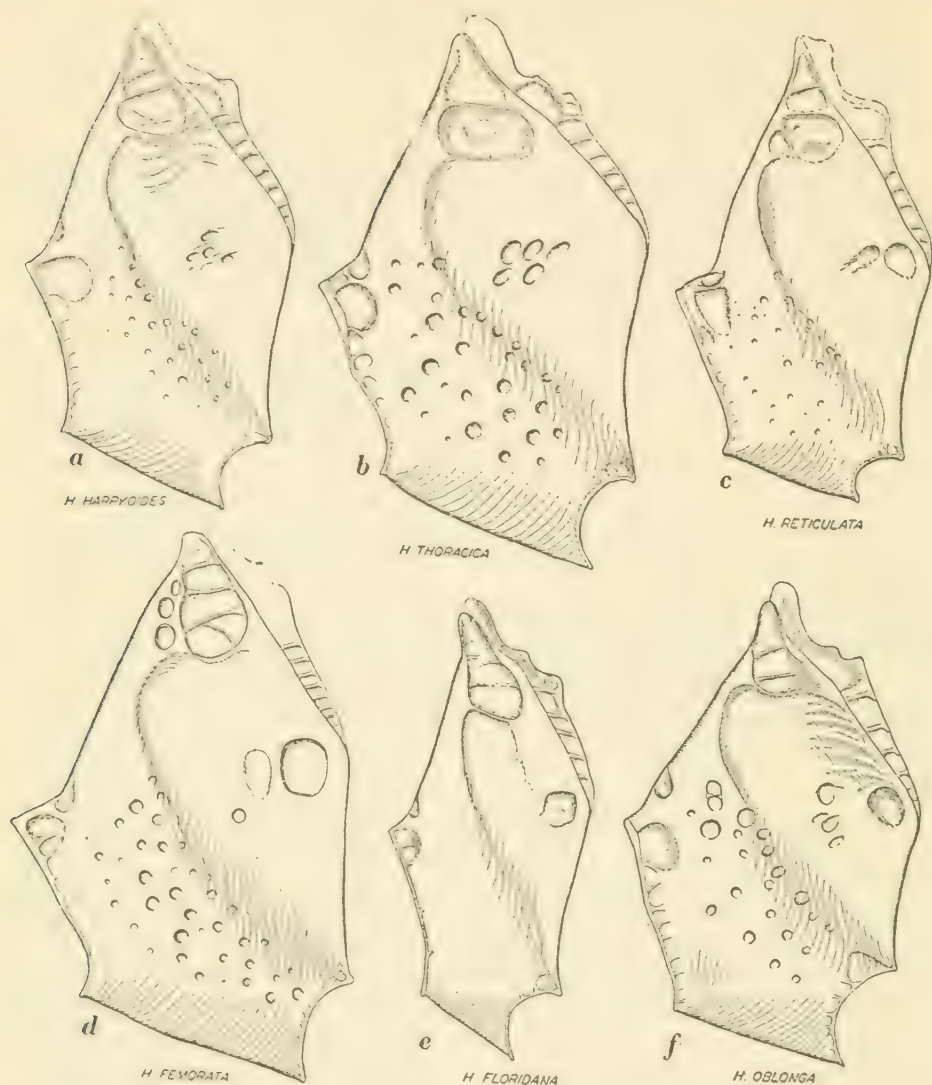


FIGURE 44.—Left mesopleura of the Nearctic species of *Hyptia* (setae and finer punctures omitted from the drawings).

1. *HYPTIA HARPYOIDES* Bradley

FIGURE 44, a

Hyptia harpyoides BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 151, 1903. Type: ♀, Philadelphia, Pa. (Ithaca).

Hyptia brevicar var. glabricaps KIEFFER, Ann. Soc. Ent. France, vol. 79, p. 72, 1910. Type: ♂, Polk County, Wis. (Claremont, Calif). New synonymy.

Punctures on frons so close that the frons appears somewhat reticulate, without convex areas between the punctures.

Forewing about 4.0 mm. long; punctures of frons all contiguous, without smooth areas between them; seventh flagellar segment of male

about 1.9 as long as wide, of female about 1.0 as long as wide; median part of pronotum as seen from above with its upper face reduced to a sharp edge; mesoscutum in dorsal view about 0.70 as long as wide, its punctures mostly adjacent to one another; mesopleurum without an impression in its median posterior corner, but often with an irregular group of impressions near the center of the oblique groove, its lower swollen part with some scattered large punctures (fig. 44, *a*); underside of hind femur with rather dense weak punctures, and with an impunctate area extending from near its apical 0.35 to the apex; longer spur of hind tibia about 1.12 as long as the shorter spur and about 0.51 as long as the hind basitarsus; first tergite with moderately fine oblique striation and some indistinct punctures.

Black or piceous. Mandible and tegular fulvous; front and middle legs and antenna from dusky fulvous to rufopiceous. Specimens with more or less extensive ferruginous coloration, as noted under the generic description, are uncommon.

Specimens.—Many males and females from CONNECTICUT (Candlewood Lake); GEORGIA (Rabun County); ILLINOIS (Zeigler); KANSAS (Baldwin, Lawrence, and Logan County at 3,322 feet); MARYLAND (Cabin John, College Park, Hyattsville, Plummers Island, and Takoma Park); MASSACHUSETTS (Forest Hills, Natick, Sagamore, and Wellesley); MICHIGAN (Antrim County, Cheboygan County, Constantine, Detroit, Douglas Lake, Grand Ledge, Huron County, Lake County, Mason County, and Midland County); MINNESOTA (Lake Minnetonka); MISSISSIPPI (Lucedale and Pass Christian); NEW HAMPSHIRE (Antrim and Concord); NEW JERSEY (Lakehurst, Malaga, Palisades, Riverton, and Wenonah); NEW YORK (Bohemia, Cold Spring Harbor, Eastport, Farmingdale, Flatbush, Huguenot, Ithaca, Millwood, Mount Merino, and Poughkeepsie); NORTH CAROLINA (Great Smoky Mountains National Park, Southern Pines, and valley of the Black Mountains); OHIO (Cedar Point and Put in Bay); ONTARIO (Marmora); PENNSYLVANIA (Buck Hill Falls, Carlisle Junction, Cedar Run, Gladwyn, Harrisburg, Heckton Mills, Inglenook, Mount Holly Springs, Rockville, and Spring Brook); RHODE ISLAND (Kingston and Westerly); SOUTH CAROLINA (Anderson); TENNESSEE (Elkmont and Cades Cove, both in the Great Smoky Mountains National Park); and VIRGINIA (Barcroft, Clifton, Dismal Swamp, East Falls Church, Falls Church, Mount Vernon, and Vienna).

Nearly all dates of capture fall between June 20 and August 15, indicating a single generation a year. Records outside of these dates are: June 5 at Anderson, S. C.; June 7 at Lucedale, Miss.; June 13 and 15 in the Great Smoky Mountains National Park of Tennessee; June 14 at Pass Christian, Miss.; August 16 at Forest Hills,

Mass.; August 21 at Midland County, Mich.; August 25 at Mount Holly Springs, Pa.; and August 28 at Flatbush, N. Y.

This evaniid has a more northern distribution than any other in the Nearctic Region. It occurs in the Eastern United States and as far west as Minnesota and Kansas, commonly in the Upper Austral and the warmer parts of the Transition Zone. This species and *Hyptia thoracica* occur in Ontario and are the only evaniids recorded from Canada.

2. *HYPTIA THORACICA* (Blanchard)

FIGURE 44, b

Erania thoracica BLANCHARD, Histoire naturelle des animaux articulés . . . , Ins., vol. 3, p. 299, 1840. Type: Carolina (lost).

Hyptiam thoracicum SHUCKARD, Entomologist, vol. 1, p. 120, 1841. Type: ♂, North Carolina (lost). Preoccupied in *Hyptia* by Blanchard, 1840.

Erania dorsalis WESTWOOD, Trans. Ent. Soc. London (ser. 2), vol. 1, p. 214, 1851. New name for *E. thoracica* Blanchard.

Hyptia breviculcar KILFFER, Arkiv Zool., vol. 1, p. 541, 1904. Type: ♀, Wisconsin (Stockholm). New synonymy.

Hyptia mylacridomanes BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 153, 1908. Type: ♀, Ithaca, N. Y. (Ithaca). New synonymy.

Hyptia hyptiogastris BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 160, 1908. Type: ♂, Tifton, Ga. (Washington). New synonymy.

Hyptia texana BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 161, 1908. Type: ♀, Galveston, Tex. (Lawrence). New synonymy.

Median hind corner of mesopleurum without a subcircular depression; punctures on frons mostly separated by convex or flattened areas; mesoscutum about 0.75 as long as wide.

Forewing about 4.3 mm. long; punctures of frons somewhat confluent in transverse rows, the rows separated by about 0.3 the diameter of the punctures; seventh flagellar segment of male about 1.5 as long as wide, of female about 1.2 as long as wide; median part of pronotum as seen from above with a very narrow upper face; mesoscutum in dorsal view about 0.75 as long as wide, its punctures mostly adjacent, or many of them separated by about 0.3 their diameter; mesopleurum without an impression in its posterior median corner, but with a group of impressions near the center of the median oblique groove, its lower swollen part with numerous large punctures (fig. 44, b); under side of hind femur with a few large weak punctures, impunctate beyond the middle; longer spur of hind tibia about 1.12 as long as the shorter spur and about 0.46 as long as the hind basitarsus; first tergite with moderately dense oblique punctures and with distinct oblique striation.

Black or piceous. Front tibia fulvous; front femur and tarsus, middle legs beyond the trochanters, mandible, and tegula more or less tinged with rufous or the mandible and tegula sometimes entirely rufous. Specimens with more or less ferruginous coloration, as noted

under the generic description, comprise about 40 percent of those I have seen.

The type of *Evania thoracica* Blanchard is not in the Paris Museum, and that of *Hyptiam thoracicum* Shuckard is not in the British Museum. Both are probably destroyed. Since their descriptions will fit several different species, the names must be assigned arbitrarily. Bradley (Trans. Amer. Ent. Soc., vol. 34, pp. 154–156, 1908) has done this in a reasonable manner, and his disposition of the names is followed. He synonymized *thoracicum* Shuckard with *thoracica* Blanchard, redefined *thoracica* Blanchard, and reported on a number of specimens that he identified as *thoracica*. His specimens and description belong to the present species.

Specimens.—Many males and females from CONNECTICUT (Lyme); DISTRICT OF COLUMBIA; FLORIDA (Crescent City, Homestead, Hudson, Jacksonville, Orlando, Paradise Key, and Seven Oaks); GEORGIA (Atlanta, Spring Creek in Decatur County, and Tifton); KANSAS (Gardner); MARYLAND (Beltsville, Prince Georges County, and Takoma Park); MASSACHUSETTS (Holliston, Humarock, Middlesex Fells, Sagamore, and Wellesley); MICHIGAN (Livingston County); MISSOURI (Kirkwood); NEW JERSEY (Glassboro, Lakehurst, and Moorestown); NEW YORK (Ithaca); NORTH CAROLINA (Southern Pines); OHIO (Put in Bay and Wayne County); ONTARIO (Go Home Bay); PENNSYLVANIA (Harrisburg and Shiremanstown); RHODE ISLAND (Westerly); SOUTH CAROLINA (Horry County); TEXAS (Brownsville and San Antonio); and VIRGINIA (Barcroft, East Falls Church, Falls Church, Mount Vernon, and Vienna).

Nearly all dates of capture fall between June 20 and July 31, indicating a single generation a year. Records outside of these dates are: May 21 and June 4 at Southern Pines, N. C.; May at Brownsville, Tex.; June 15 at Beltsville, Md.; August 2 at Falls Church, Va.; August 15 at Wellesley, Mass.; August 20 at Orlando, Fla.; and September 14 at Falls Church, Va.

This species occurs from the Atlantic States west to Michigan and Kansas, from the Tropical Zone to the warmer parts of the Transitional Zone. There is a single record from Ontario, Canada (Go Home Bay). Two specimens in the U. S. National Museum were reared as follows: ♂, Kirkwood, Mo., August 1939, *ex* oötheca *Parcoblatta pennsylvanica*; ♀, Vienna, Va., collected September 1936, emerged 1937, J. C. Bridwell, *ex* oötheca *Parcoblatta* sp.

3. HYPTIA RETICULATA (Say)

FIGURE 44, c

Brachygaster reticulata SAY, Boston Journ. Nat. Hist., vol. 1, p. 223, 1836; LeConte ed., vol. 2, p. 686. Type: Indiana (destroyed).

Hyptia nyctoides BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 159, 1908. Type: ♂, Farmingdale, N. J. (Washington). New synonymy.

Hyptia prosethetetra BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 160, 1908. Type: ♂, Tifton, Ga. (Washington). New synonymy.

Median hind corner of mesopleurum with a subcircular depression; femora black, mesoscutum in dorsal view about 0.75 as long as wide.

Forewing about 4.3 mm. long; punctures of frons somewhat confluent in transverse rows, the rows separated by about 0.33 the diameter of the punctures; seventh flagellar segment of male about 1.6 as long as wide, of female about 1.1 as long as wide; median part of pronotum as seen from above with a narrow upper face; mesoscutum in dorsal view about 0.75 as long as wide, its punctures mostly adjacent to one another; mesopleurum with an impression near its median posterior corner, its lower swollen part with scattered moderately large punctures (fig. 44, *c*); under side of hind femur with moderately dense fine punctures, its impunctate area extending from about its apical 0.35 to the apex; longer spur of hind tibia about 1.25 as long as the shorter spur and about 0.55 as long as the hind basitarsus; first tergite with moderately dense punctures and a suggestion of oblique striation.

Black or piceous. Tegula and apical part of mandible dark ferruginous; antenna and fore and middle legs somewhat tinged with ferruginous. Specimens with more or less ferruginous coloration, as noted under the generic description, comprise about 40 percent of those I have seen.

Say's description of *Brachygaster reticulata* would fit *Hyptia thoracica* or *H. harpyoides* as well as the present species except for his statement "petiole punctured." In both *thoracica* and *harpyoides* the petiole has distinct oblique striation as well as more or less distinct punctuation.

Specimens.—Many males and females from FLORIDA (Crescent City, near Everglade, Lakeland, Langford, Paradise Key, and St. Petersburg); GEORGIA (Bainbridge, DeWitt, Griffin, Okefenokee Swamp, Thomasville, and Tifton); LOUISIANA (Opelousas); MARYLAND (Glen Echo); MASSACHUSETTS (Holliston and Wellesley); MEXICO (Minatitlán and Tuxtepec); MICHIGAN (Midland County and Muskegon County); NEW YORK (Farmingdale, Fishers Island, and Flatbush); NORTH CAROLINA (Southern Pines); PENNSYLVANIA (near Philadelphia); TEXAS (Chisos Mountains in Brewster County); and VIRGINIA (Cape Henry, Falls Church, Hot Springs at Deer Lick Mountain, and Virginia Beach).

Collection records for the Northeastern United States fall in July and the first half of August, except for captures at Falls Church, Va., on September 4, and at Cape Henry, Va., on September 9. In Florida

the species appears on the wing late in April: there is a record for May at Opelousas, La., three for June 15 to 23 in southern Georgia, and one for June 1 at Southern Pines, N. C. At three Florida localities it was taken August 10, August 18, and August 22. This seasonal distribution indicates one generation a year in the North and perhaps two in Florida.

This species occurs from the Atlantic States west to Michigan and Kansas, from the Tropical and Lower Austral Zones to the warmer part of the Transition Zone. It has been collected also in southern Mexico.

4. *HYPTIA FEMORATA*, new species

FIGURE 44, *d*

Femora ferruginous; upper anterior part of mesopleurum with about three subcircular impressions as in figure 44, d.

Forewing about 4.0 mm. long; punctures of frons somewhat confluent in transverse rows, the rows separated by about 0.33 the diameter of the punctures; seventh flagellar segment of male about 1.3 as long as wide, of female about 1.1 as long as wide; median part of pronotum as seen from above with a very narrow upper face; mesoscutum in dorsal view about 0.74 as long as wide, its punctures separated by about 0.5 their diameter; mesopleurum with an impression in its median posterior corner, its ventral swelling with numerous large punctures (fig. 44, *d*): under side of hind femur with rather sparse coarse punctures, its impunctate area extending from near its basal 0.45 to its apex; longer spur of hind tibia about 1.2 as long as the shorter spur and about 0.48 as long as the hind basitarsus; first tergite with moderately fine oblique striae and some scattered punctures.

The type is colored as follows: Black. Mandible, scape, tegula, legs beyond coxae, and first tergite ferruginous, the hind tarsus and apex of hind tibia somewhat infusate. A paratype male from Uvalde, Tex., is colored like the type. A paratype male from Davis Mountains, Tex., is colored as the type, except that the mandible and scape are fuscoferruginous, the hind tibia and tarsus are piceous, and the apical part of the hind femur infusate. A paratype female is ferruginous with a large median basal fuscous spot on the second tergite, and the apical part of the abdomen and the hind leg beyond the trochanters weakly infusate.

Type.—♂, Chisos Mountains, Tex., July 9, 1936, J. N. Knull (Washington). U.S.N.M. No. 58749.

Paratypes.—♂, Davis Mountains, Jeff Davis County, Tex., June 29, 1942, H. A. Scullen (Corvallis). ♀, Davis Mountains, Jeff Davis

County, Tex., July 9, 1942, H. A. Scullen (Washington). ♂, Uvalde, Tex., June 18, 1920, Wickham (Cambridge).

5. *HYPTIA FLORIDANA* Ashmead

FIGURE 44, c

Hyptia floridana ASHMEAD, Can. Ent., vol. 33, p. 303, 1901. Lectotype hereby selected: ♂, Biscayne Bay, Fla. (Washington).

Mesoscutum about 0.54 as long as wide; forewing about 2.3 mm. long.

Forewing about 2.3 mm. long; punctures on frons tending to form transverse rows, the rows separated by about 0.6 the diameter of the punctures; seventh flagellar segment of male about 1.33 as long as wide, of female about 1.0 as long as wide; central 0.6 of mesoscutum reduced so that it is not visible from above; mesoscutum in dorsal view about 0.54 as long as wide, its punctures separated by about 0.5 their diameter; mesopleurum with an impression in its median posterior corner, its lower swollen part with only fine punctures or with a very few medium-sized punctures intermingled (fig. 44, c); under side of hind femur with small punctures, its impunctate area extending from near its middle to the apex; longer spur of hind tibia about 1.15 as long as the shorter spur and about 0.47 as long as the hind basitarsus; first tergite with moderately coarse oblique striae and scattered oblique punctures.

Black or piceous. Mandible, tegula, tibial spurs, and front and middle tarsi fulvous to brownish fulvous; front and middle legs more or less tinged with fulvous in the male, definitely fulvous in the female. In the female the scape, basal flagellar segments, and apical 0.4 of first tergite are more or less definitely fulvous. Two specimens from Guatemala and Panama have the head and thorax largely ferruginous.

Specimens.—♂, Jacksonville, Fla. (paratype, Washington). 2 ♂♂, 3 ♀♀, feeding on petiolar nodules of *Ricinus communis*, Miami, Fla., October 3, 1918 (Washington). ♀, Miami, Fla. (New York). ♂, De Witt, Ga., June 8, 1914, C. S. Spooner (Ithaca). ♀, Tallulah, La. (Washington). ♂, Concepción, 1,400 feet, Guatemala, C. N. Ainslie (Washington). ♀, Porto Bello, Panama, March 6, 1911, E. A. Schwartz (Washington).

6. *HYPTIA OBLONGA*, new species

FIGURE 44, f

Mesopleurum just below the oblique carina with oblique rugae; mesoscutum about 0.90 as long as wide.

Forewing 2.6 to 3.7 mm. long; punctures on frons separated by about 0.2 to 0.4 their diameter; seventh segment of flagellum of male

about 1.5 as long as wide, of female about 1.2 as long as wide; median part of pronotum as seen from above with a narrow upper face; mesoscutum in dorsal view about 0.90 as long as wide, its punctures separated by about 0.33 their diameter in larger specimens and by about 0.67 their diameter in smaller specimens; mesopleurum with an impression in its median posterior corner, with oblique ridges near its upper posterior margin, and in larger specimens with some large punctures on its lower swollen part (fig. 44, *f*); under side of hind femur with small and moderately small punctures, it impunctate area extending from about its middle to the apex; longer spur of hind tibia about 1.2 as long as the shorter spur and about 0.40 as long as the hind basitarsus; first tergite with scattered oblique punctures and a very fine sculpture that gives it an opaque glaucous surface.

Black or largely ferruginous. In a black specimen the mandible except basally, tegula, front tibia and tarsus, and middle tarsus are fulvous, and the apical 0.3 of first tergite is tinged with ferruginous. All specimens but one from Mexico have more or less extensive ferruginous coloration, as noted under the generic description.

Type.—♀, Huachuca Mountains, Ariz., July 20, 1937, D. J. and J. N. Knull (Washington). U.S.N.M. No. 58750.

Paratypes.—♀, Evergreen, Ala., August 2 (Washington). ♂, Spring Creek, Decatur County, Ga., July 16 to 29, 1912 (Ithaca). ♂, Suerre, Atlantic side, Costa Rica, July 20, 1923, A. Alfaro (Washington). ♂, Cuernavaca, Mexico, November 4, 1922, E. C. Smyth (Washington).

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